CHAPTER 6
4.2-INCH MORTAR, M30

The 4.2-inch mortar, M30, delivers timely, accurate fires to meet the requirements of supported troops. This chapter discusses assigned personnel duties, organization, operation, carriers, and ammunition.

Section I. SQUAD AND SECTION ORGANIZATION AND DUTIES

Each member of the infantry mortar squad has principal duties and responsibilities. (See FM 7-90 for platoon drills.)

6-1. ORGANIZATION

The 4.2-inch mortar section is the basic fire unit for the mortar platoon. If the mortar section is to operate quickly and effectively in accomplishing its mission, mortar squad members must be proficient in individually assigned duties. Correctly applying and performing these duties enables the mortar section to perform as an effective fighting team. The platoon leader commands the platoon and supervises the training of the elements. He uses the chain of command to assist him in effecting his command supervising duties.

6-2. DUTIES

The 4.2-inch mortar squad consists of four men (Figure 6-1, page 6-2). Their firing positions and principal duties are as follows:

a. The *squad leader* stands behind the mortar where he can command and control his squad. In addition to supervising the emplacement, laying, and firing of the mortar, he supervises all other squad activities.

b. The *gunner* stands on the left side of the mortar where he can manipulate the sight and elevating gear handle and traversing assembly wheel. He places firing data on the sight and lays the mortar for deflection and elevation. He and the assistant gunner make large deflection shifts by shifting the bridge assembly (or turntable when track mounted).

c. The *assistant gunner* stands to the right of the mortar, facing the barrel and ready to load. In addition to loading, he assists the gunner in laying the mortar by cross-leveling the sight. He is responsible for swabbing the bore after each 10 rounds have been fired, or after each end of (fire) mission. He assists the gunner in shifting the bridge assembly (or turntable, if track mounted) when making large deflection changes, and shifts the mortar from low range to high range or vice versa when making large elevation changes.

d. The *ammunition bearer/driver* stands behind the mortar to maintain, prepare, and then pass the ammunition to the assistant gunner for firing. He also places out the aiming post. If necessary, he is also responsible (along with the squad leader) for the combat readiness of their mortar carrier.

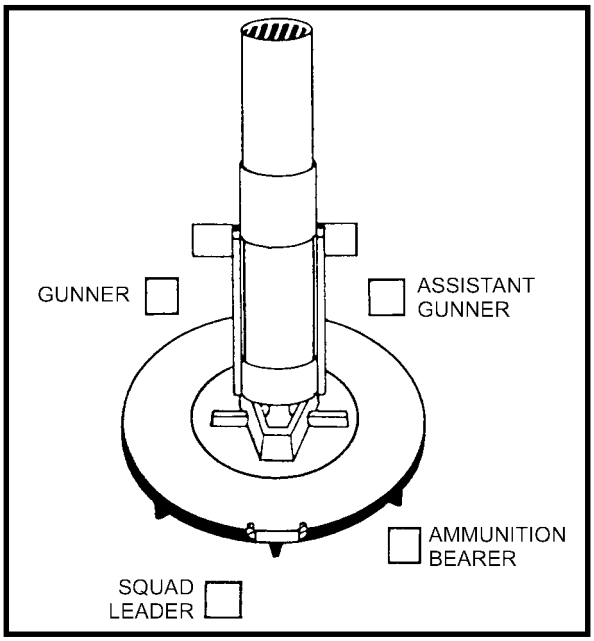

Figure 6-1. Positions of squad members.

6-3. SECTION DRILL AND SECTION LEADER DUTIES

Section training is the commander's responsibility. His imagination and ingenuity determine the value of this training; therefore, a prescribed sequence of training is not listed. The mortar section is drilled in all aspects of section training under the supervision of the section leader.

a. The section leader is located in the mortar section of the infantry heavy mortar platoon. He is responsible for the actions of the three mortar squads under his control. The duties of the section leader are as follows:

- Supervises the occupation of the firing position.
- Lays the section.
- Checks communications with the FDC and mortar squads.
- Gives section leader's report to the FDC.
- Has the mortar sights calibrated, if time permits.
- Controls the delivery of fires as directed by the FDC.
- Ensures that adequate and balanced stocks of ammunition are on hand and properly stored.
- Supervises the accounting of ammunition to include lot registration and control.
- Ensures that the section is laid on final protective fire data when not otherwise engaged.

b. At intervals, the squad is given the command to refer and realign their aiming posts and to remove misfires from the mortar.

Note: Guidelines for a training program can be found in ARTEP 7-90-MTP and ARTEP 7-90-Drill.

Section II. COMPONENTS

The 4.2-inch mortar, M30 (Figure 6-2), is a rifled, muzzle-loaded weapon with the mission to deliver high-angle, indirect fire. During firing, its components absorb the forces of recoil as a unit. The mortar can be hand carried for short distances when disassembled into five loads.

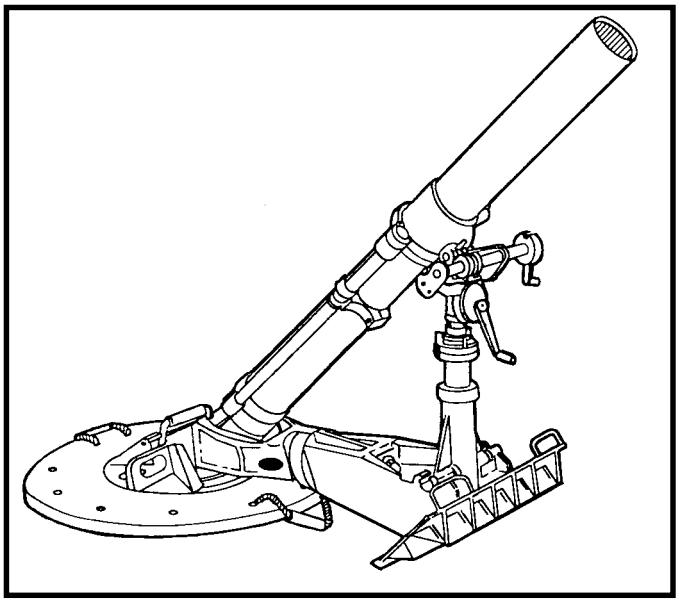

Figure 6-2. 4.2-inch mortar, M30.

6-4. TABULATED DATA

The tabulated data for the 4.2-inch mortar, M30, are as shown in Table 6-1.

WEIGHTS (pounds)		
Mortar complete (welded steel rotator and M53 sight)	672.25	
Cannon, M30	156.50	
Bridge assembly	169.00	
Baseplate assembly	193.00	
Standard assembly	59.50	
Rotator assembly		
Cast magnesium	57.50	
Welded steel	89.00	
Sight, M53	5.25	
RANGE (M329A2 ammunition) (meters)		
Maximum (approximate)	6,840	
Minimum (approximate)	770	
ELEVATION (Level ground; flat, even surface) (mils)	**LOW RANGE**	**HIGH RANGE**
Maximum	933	1156
Minimum	706	919
Firing elevations	800 or 900	900 or 1065
For each turn of elevating handle (approx)	13	13
SHIFTS (mils)		
Per turn of traversing crank (approximately)	10	
On traversing mechanism (right or left from center)	125	
Movement of standard assembly and bridge assembly	6400	

RATE OF FIRE (M329A2 ammunition)

The maximum rate of fire is 18 rounds per minute for the first minute and 9 rounds per minute for the next five minutes. This can be followed by a sustained rate of fire of 3 rounds per minute for prolonged periods.

Note: Locational terms “right,” “left,” “front,” and “rear” regarding the 4.2-inch mortar, M30, and sightunits, M53 and M64 series, apply when viewed in the direction the mortar is firing.

Table 6-1. Tabulated data for the 4.2-inch, M30.

6-5. MORTAR CANNON, M30

The cannon (also referred to as the barrel) is a rifled tube 60 inches (152.4 centimeters) long with an inside diameter of 106.7 mm (4.2 inches) between lands (Figure 6-3). This rifling consists of 24 lands and 24 grooves of which the first 9 inches (22.86 centimeters), as measured from the base inside the barrel, are straight. The twist increases to the right from zero at this point to one turn in 84 inches (213 centimeters). The tube cap and firing pin are combined in a one-piece casting that screws onto the barrel. The trunnion pins on the cap fit into slots in the cap trunnion sockets in the bridge. These trunnion pins lock the cannon to

the bridge assembly or socket assembly (track mounted) during firing. The coupling and sight mount assembly are held in position by two fully enclosed shock absorbers. The cannon is fastened to the standard assembly at this coupling. The sight socket and sight mount assembly are attached to this coupling.

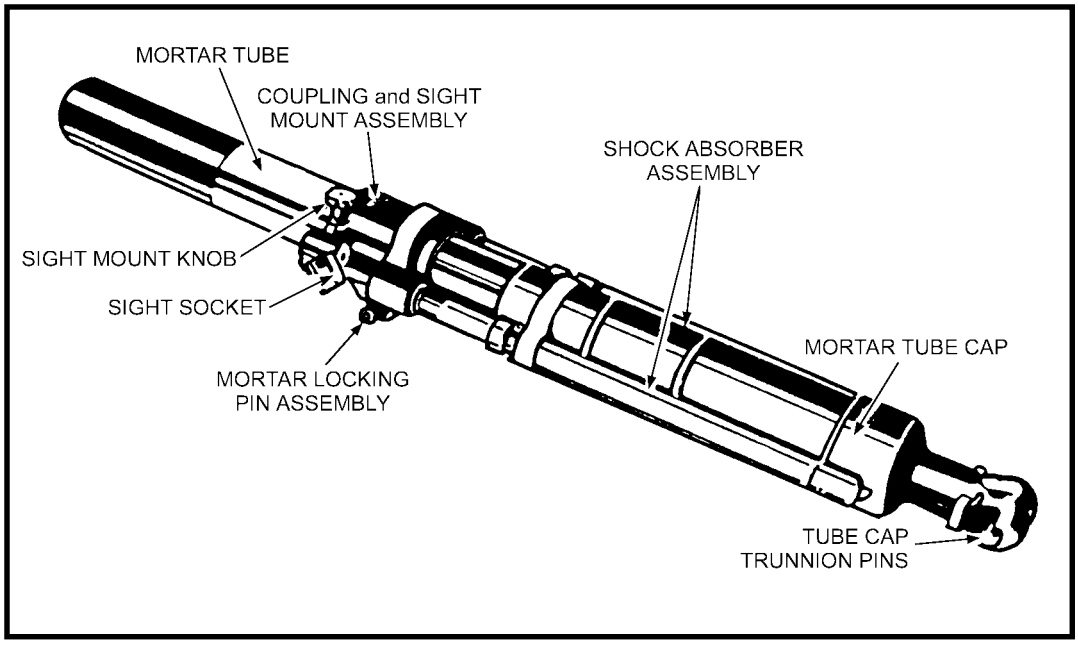

Figure 6-3. Cannon, M30.

Note: Although the terms cannon, tube, and barrel indicate an assembly in which ammunition is fired and which controls the initial direction of a projectile, in mortar terminology barrel is the most commonly used term. The M30 mortar cannon is the complete assembly consisting of the mortar tube, tube cap, firing pin, tube cap trunnion pins, coupling and sight mount assembly, sight socket, and shock absorbers. In order to facilitate understanding and increase learning, the term barrel is used throughout this chapter in all references pertaining to the mortar cannon (the complete cannon assembly).

6-6. MORTAR MOUNT, M24Al

The mortar mount consists of the standard assembly, bridge assembly, rotator assembly, and baseplate.

a. **Standard Assembly**. The standard assembly consisting of the elevating, traversing, and recoil mechanisms connects the cannon and bridge assembly or standard support on the turntable (Figure 6-4, page 6-6). It is held to the bridge assembly by two trunnions that fit into sockets on the bridge spade or standard support assembly. The connection for the mortar locking pin assembly on the standard assembly is fastened to the coupling and sight mount assembly by the mortar locking pin assembly. Both the elevating and traversing screws are enclosed.

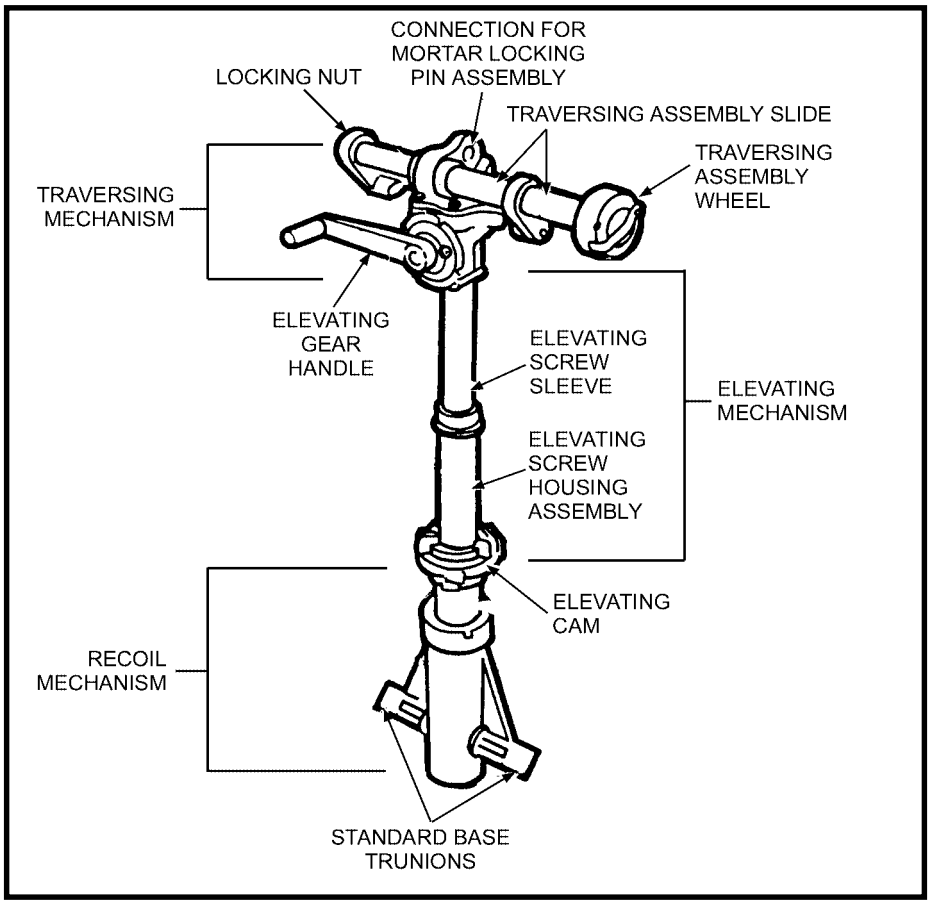

Figure 6-4. Standard assembly with elevating, traversing, and recoil mechanisms.

(1) The elevating gear handle, located in front of the mortar at the top of the standard assembly, is used to elevate or depress the mortar throughout the low or high ranges of elevation. An elevating screw housing assembly in the lower part of the standard assembly makes possible the two ranges of elevation. The desired high or low range is selected by using the elevating mechanism cam located just above the recoil mechanism on the standard assembly.

(2) The elevating mechanism cam (Figure 6-4) locks the elevating screw housing assembly in its low or high range position. This assembly cannot be locked in any intermediate position.

(3) The traversing mechanism (Figure 6-4) consists of an enclosed screw and bearing located at the top of the standard assembly. It is operated by turning the traversing crank on the left side of the mechanism.

(4) The recoil mechanism consists of a series of springs mounted in the lower section of the standard assembly. They are designed to ease the downward shock of firing and to return the mechanism to the prefiring position.

b. **Bridge Assembly**. The bridge assembly (Figure 6-5) consists of two pieces joined by a swivel joint.

(1) The socket end is designed to receive the tube cap. It has a closed slot in the left side of the socket and an open slot in the right side. These slots receive the tube cap trunnions. Two bridge trunnions behind the socket fit into the bridge trunnion socket on the rotator.

(2) The spade at the front of the bridge assembly facilitates the digging action of the bridge assembly during firing. Two steel trunnion sockets to the rear of the spade hold the standard assembly.

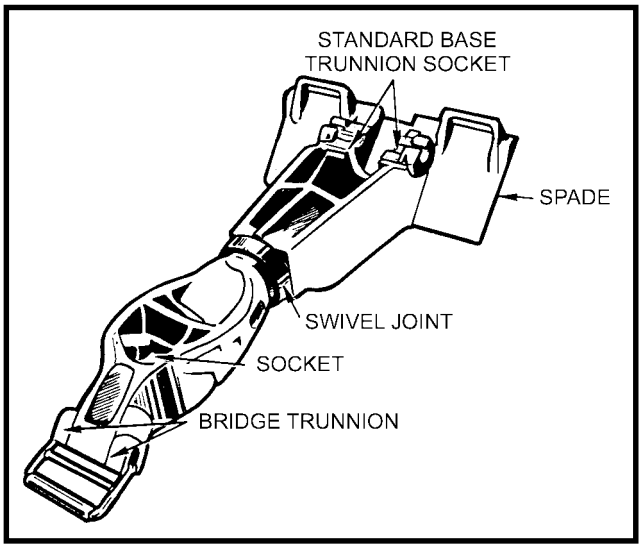

Figure 6-5. Bridge assembly.

c. **Rotator Assembly**. The rotator assembly (Figure 6-6, page 6-8) is about 20 inches (50.8 centimeters) in diameter. The bridge trunnion sockets are on the upper side of the rotator assembly. A projection on the underside fits into a recess in the baseplate assembly and contains the rotator slide lock. The rotator slide lock is actuated by the insertion of the bridge trunnions into their sockets, which depresses the expansion pin and securely locks the rotator and baseplate assemblies together. This projection also forms the pivot around which the rotator assembly rotates on the baseplate assembly.

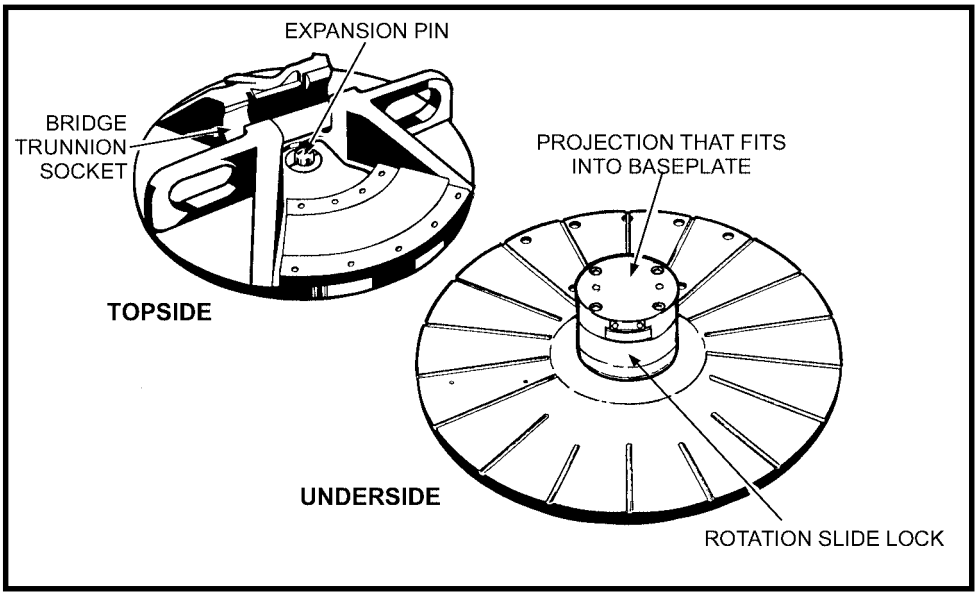

Figure 6-6. Rotator assembly.

d. **Baseplate and Rotator Assemblies**. The baseplate assembly (Figure 6-7) is about 38 inches (96.52 centimeters) in diameter. A recess in the center receives the bottom insert of the rotator assembly. The lower surface contains six ribs to increase the area in contact with the ground. Each rib has a depth of about 6 1/2 inches (16.51 centimeters).

WARNING

Two carrying handles are provided but not recommended for use since possible bodily injury may result.

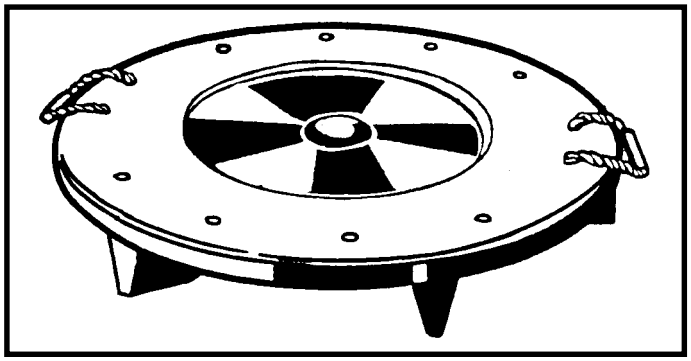

Figure 6-7. Baseplate.

Section III. OPERATION OF GROUND-MOUNTED MORTAR

This section contains information on how to prepare the 4.2-inch mortar, M30, for firing; how to conduct safety checks; and how to perform misfire procedures. The battalion heavy mortar platoon may be employed as a complete platoon of six mortar squads or it may be split and employed as two firing sections.

6-7. MOUNTING OF THE MORTAR

The purpose of squad drill is to develop teamwork within the mortar squad and to cross-train each mortar squad member.

a. The squad leader picks up the sight case and two aiming posts, and moves to the exact position where the mortar is to be mounted. He places the sight case and aiming posts to the left front of the mortar position. He then points to the exact spot where the mortar is to be mounted and indicates the initial direction of fire. He commands, ACTION.

b. The gunner on the left side and assistant gunner on the right secure the baseplate and rotator assemblies (carried as one unit). They place it in the position indicated by the squad leader. The assistant gunner positions the rotator assembly in the desired direction of fire.

c. The gunner ensures that the sandbags or ammunition boxes are in position so that the bridge assembly rests on them. (Sandbags or ammunition boxes are used only for gunner examinations, crew drills, and demonstrations.) When the mortar is fired, the baseplate assembly is dug in to be firmly placed on the ground. This also ensures that the bridge assembly is level with the baseplate assembly.

Note: Squad members move to the mortar position from the left side and return on the right side when assembling and disassembling the cannon.

d. The squad leader and ammunition bearer secure the bridge assembly; the ammunition bearer carries the socket end and seats the trunnions of the bridge assembly into the trunnion socket of the rotator. The squad leader elevates the spade end of the bridge, thus allowing the trunnions to slide into place (Figure 6-8). The squad leader places the spade end down on the sandbags or ammunition box and positions it so it is level in the horizontal plane.

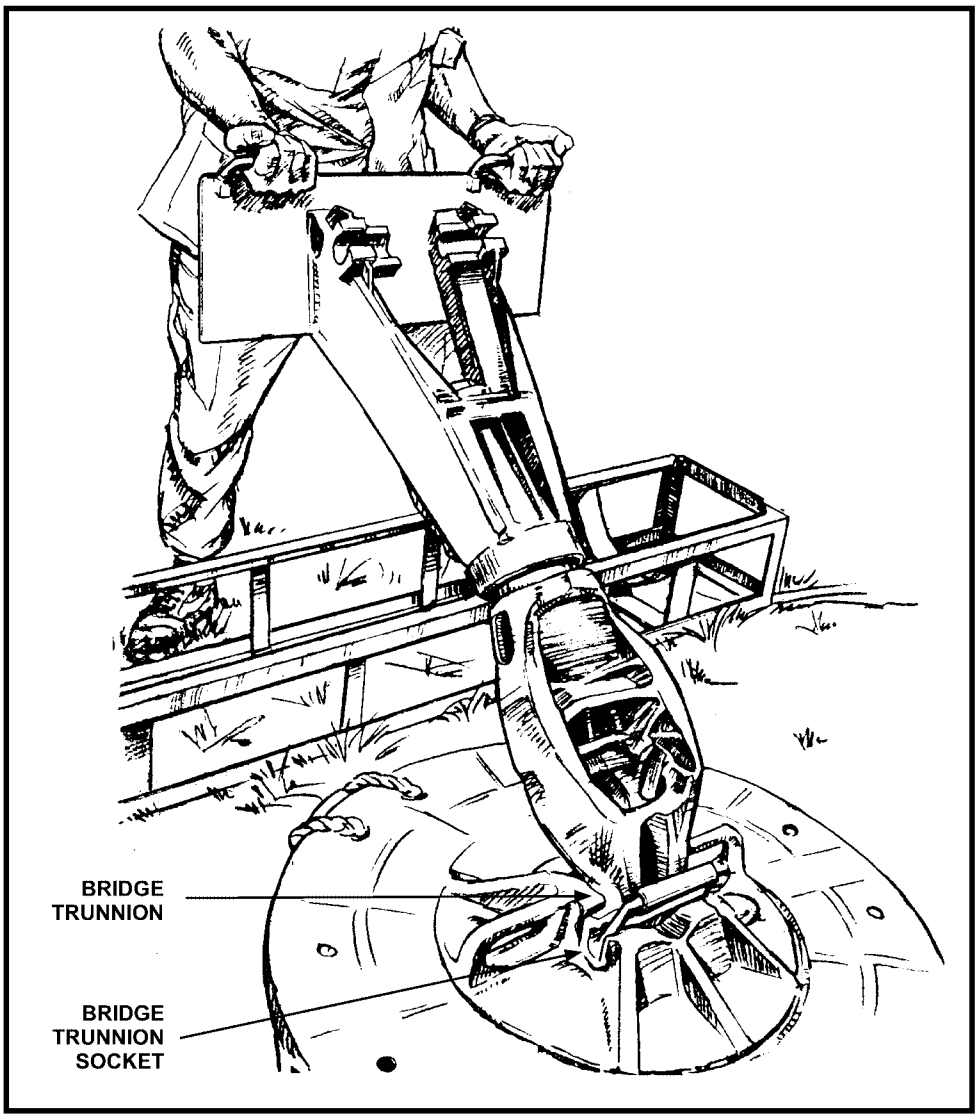

Figure 6-8. Rotator and bridge assemblies installed.

e. The assistant gunner picks up the standard assembly with his right hand on the traversing assembly wheel and his left hand on the locking lug. He places the standard base trunnions behind the standard base bearings, tilts the top of the standard forward, and pulls the standard toward himself. The standard base trunnions fall into the standard base trunnion sockets (Figure 6-9). The assistant gunner raises the standard assembly to the vertical position, turns the traversing assembly slide 180 degrees, centers the traversing assembly slide, and elevates the elevating mechanism 15 turns.

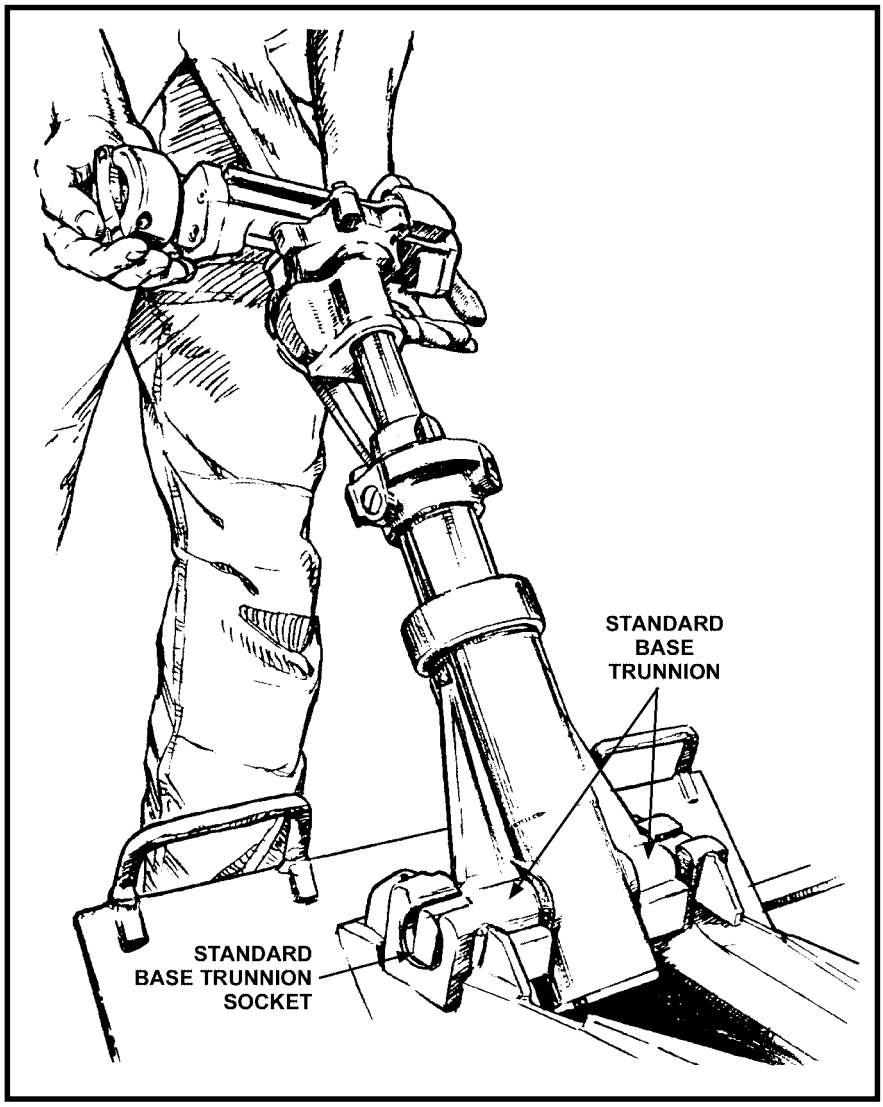

Figure 6-9. Installation of standard assembly.

f. The squad leader and ammunition bearer secure the barrel (the squad leader carrying the muzzle end) and bring it up on the left side. The squad leader inserts the left tube cap trunnion pin into its recess in the left side of the bridge socket (Figure 6-10). The ammunition bearer than cants the barrel to the right, allowing the right tube cap trunnion pin to slide down an elongated slot to its socket, and places the barrel on the right shoulder of the assistant gunner.

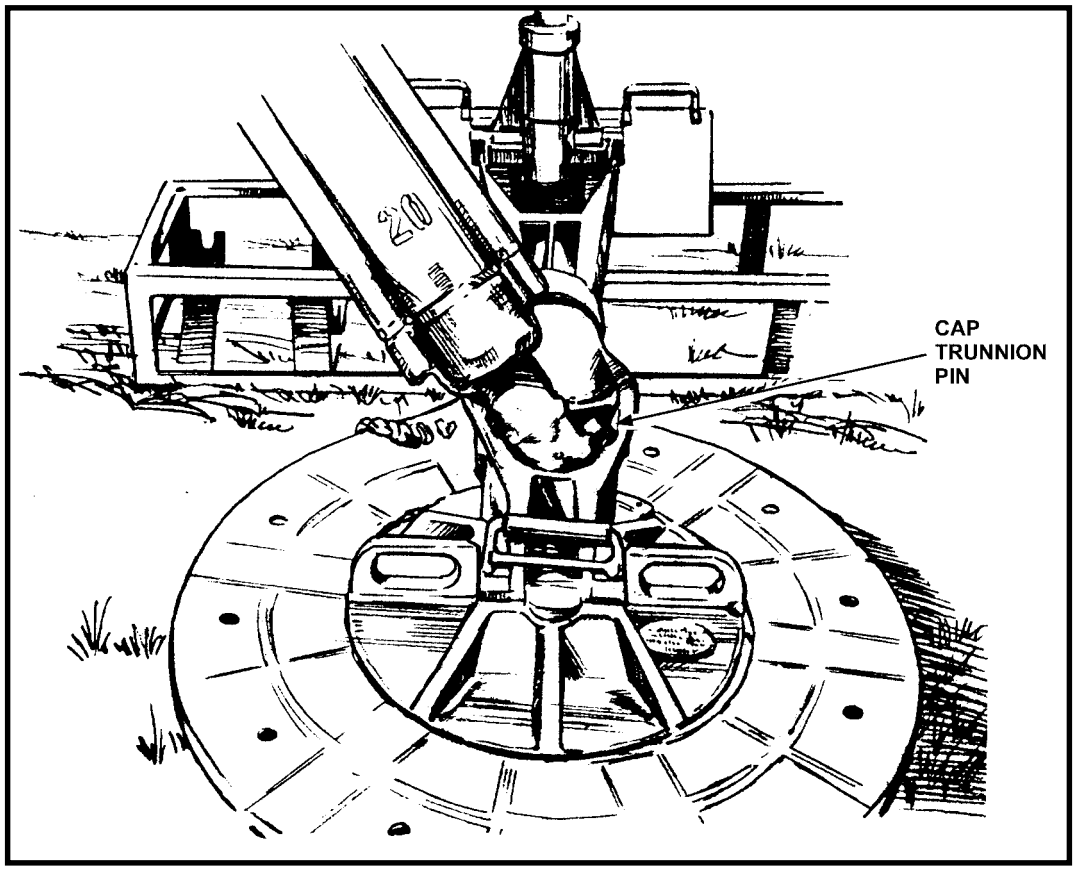

Figure 6-10. Barrel positioned into the bridge assembly.

g. The ammunition bearer withdraws the mortar locking pin assembly. The assistant gunner lowers the barrel until it fits into position on the locking lug of the slide assembly. He inserts the mortar locking pin and turns it 180 degrees in either direction to lock the barrel to the standard assembly (Figure 6-11). He removes the muzzle cover.

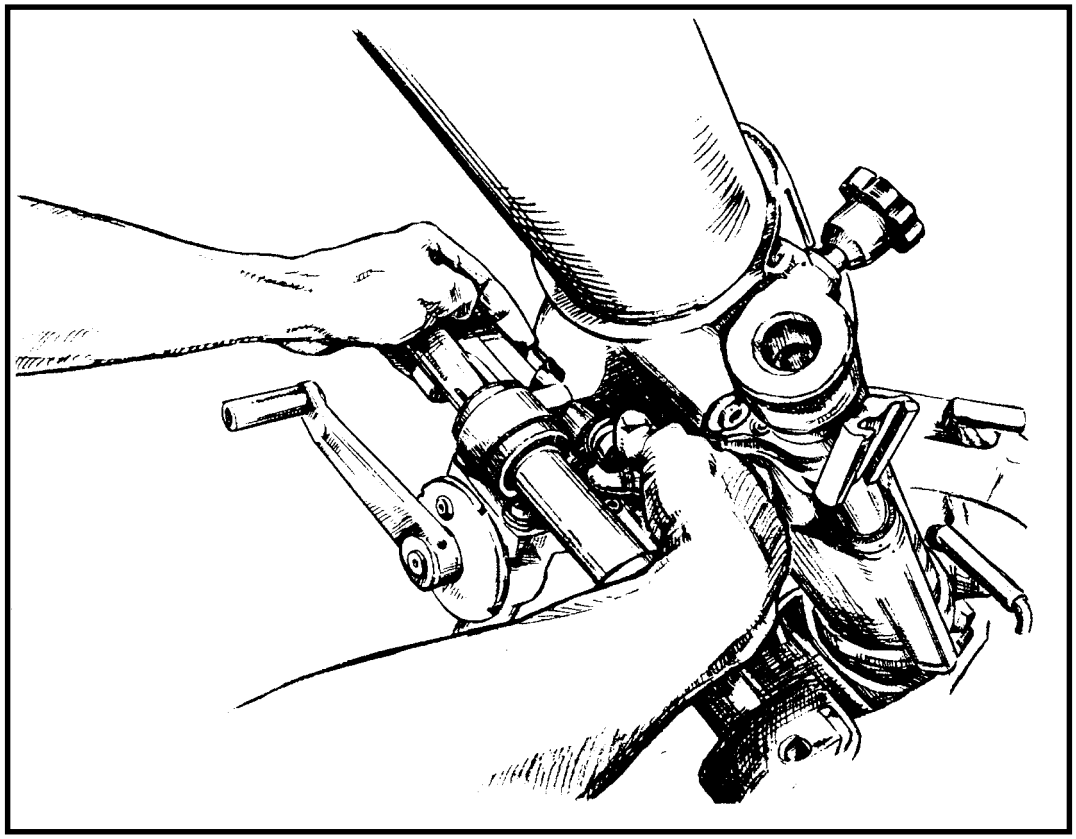

Figure 6-11. Barrel locked to the standard assembly.

h. The gunner (who has placed a 3200-mil deflection on the deflection scale of the M53 sightunit and 900 mils elevation) now places the sightunit on the mortar (Figure 6-12). He then ensures that the unit is properly seated in the sight socket to prevent errors or damage to the sight. Aided by the assistant gunner, he levels the mortar and announces, "Up."

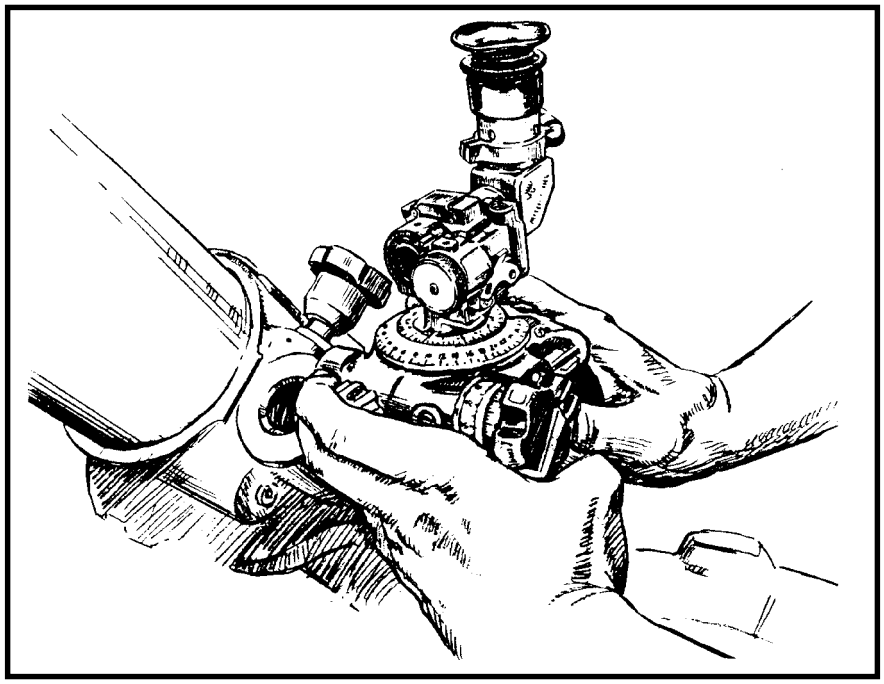

Figure 6-12. Sightunit installed.

i. The squad leader verifies the proper mounting of the mortar and notifies the section leader that this mortar is mounted by announcing, "Number two (or appropriate mortar number) up."

6-8. SAFETY CHECKS BEFORE FIRING

The following safety checks must be enforced before firing the mortar.

a. The gunner ensures that—

(1) Tube cap trunnion pins are properly inserted into the bridge socket.

(2) Bridge trunnions are properly inserted into the bridge trunnion socket of the rotator assembly.

(3) There is clearance between the bridge assembly and the rotator pad.

(4) The bridge spade has contact with the ground (sandbags should not be used to support the bridge spade during firing) and that any noticeable cant has been removed from the weapon.

(5) Standard base trunnions are properly seated into the sockets of the bridge.

(6) Elevating assembly cam is in the locked position.

(7) Standard assembly is properly coupled and locked to the barrel by the mortar locking pin assembly (turned 180 degrees in either direction).

(8) The mortar has mask and overhead clearance by placing his head near the tube cap and sighting along the barrel for any obstructions in the path of the round. The gunner checks the mortar at its maximum and minimum firing elevations.

b. The assistant gunner ensures that the bore is clean and swabs the bore dry. During firing, he swabs the bore after every 10 rounds fired or at the completion of each fire mission.

c. The ammunition bearer ensures that—

(1) Ammunition is clean and that all rust-preventive compound is removed from the fuze, body, cartridge container, and flash holes.

(2) Fuzes are screwed tightly against the shell body. If fuzes are loose, the ammunition bearer tightens them with the correct fuze wrench.

(3) Correct charge is placed on each cartridge, and the propelling charges are positioned properly.

(4) Ignition cartridge is present and the striker nut is tight.

Note: See TM 9-1015-215-12 for more information.

WARNING

The squad leader supervises the enforcement of safety procedures to prevent injury to personnel or damage to equipment.

6-9. SMALL DEFLECTION CHANGE

With the mortar mounted and sight installed, the sight is laid on the two aiming posts (placed out 50 to 100 meters from the mortar) on a referred deflection of 2800 mils and elevation of 900 mils. The mortar is within two turns of center of traverse, and the vertical cross line of the sight is on the left edge of the aiming post.

a. The gunner is given a deflection change in a fire command between 50 to 75 mils inclusive. As soon as the deflection change is announced, the gunner places the announced deflection on the sightunit and traverses back onto the aiming post. The sight is cross-leveled by the assistant gunner.

b. After the gunner has announced, "Up," the mortar should be checked by the squad leader to determine if the exercise was performed correctly.

6-10. LARGE DEFLECTION AND ELEVATION CHANGES

With the mortar mounted and sight installed, the sight is laid on the two aiming posts (placed out 50 and 100 meters from the mortar) on a referred deflection of 2800 mils and an elevation of 900 mils (low range).

a. The gunner is given a deflection and elevation change in a fire command. The gunner must shift the mortar between 200 and 300 mils inclusive and make an elevation change that causes him to elevate or depress the barrel. As soon as the deflection and elevation changes are announced, the gunner places the announced deflection on the sightunit. The assistant

gunner unlocks the elevating mechanism cam and places the mortar in high or low range, whichever is appropriate.

b. The gunner elevates or depresses the mortar until the bubble floats freely. The assistant gunner picks up the spade end of the bridge. Looking through the sight, the gunner places his left hand on the assistant gunner's shoulder, pulling to the left or pushing to the right, until the vertical cross line is on or near the correct sight picture.

c. The assistant gunner moves back into position and cross-levels the sightunit. The mortar should be within two turns of center of traverse when the exercise is completed.

6-11. LOADING AND FIRING OF M329A2 ROUND

On receiving a fire command from the section leader, the gunner repeats each element. He places the firing data on the sight and, aided by the assistant gunner, lays the mortar. The ammunition bearer repeats the charge element when announced by the gunner and prepares the round with that charge. (If a fuze setting is announced, the ammunition bearer also repeats the setting and places it on the fuze.) He completes his preparation of the round to include the safety checks. The squad leader spot-checks the data on the sight and the lay of the mortar. He then commands, FIRE. The crew fires the mortar as follows:

a. If firing from a ground mount, the gunner removes the sightunit, being careful not to disturb the lay of the mortar. He continues to remove the sightunit until the baseplate assembly is settled and there is no danger of the sightunit becoming damaged from the recoil of the mortar.

b. The first ammunition bearer passes a round to the assistant gunner. He holds the round with the palms of both hands up near each end of the round so that the fuze is pointing in the general direction of the mortar.

c. The assistant gunner takes the round from the first ammunition bearer with his right hand palm up and his left hand palm down. The assistant gunner grasps the body of the round near the center and guides it into the barrel as far as the rotating band. The tail end (tail assembly, projectile base, and rubber obturator) of the cartridge is inserted into the muzzle. The assistant gunner rotates the cartridge clockwise until the pre-engraved band (M329A2 cartridge) engages the lands and grooves (rifling) in the barrel. The assistant gunner lowers the cartridge into the barrel (to the "4.2-INCH-M" marking).

d. While lowering the cartridge, the assistant gunner rotates it clockwise, ensuring the cartridge follows the twist of the rifling. He cuts both hands sharply away and down along the barrel. At the same time, he pivots to the left and bends toward the first ammunition bearer, extending his hands to receive the next round. The assistant gunner must not disturb the lay of the mortar as he loads the round (the round can bind when the base end enters the barrel). This can cause considerable dispersion in the target area and can create unsafe conditions because of erratic fire.

6-12. MALFUNCTIONS

See Chapter 3, paragraph 3-14 for a detailed discussion of malfunctions.

6-13. REMOVAL OF A MISFIRE

Misfire procedures are described herein.

a. During firing, the first crew member who notices a misfire has occurred announces, "Misfire."

(1) When a misfire is announced, the entire squad stays with the mortar. If the round did not slide down the barrel and the projectile body can be grasped, the gunner removes the stuck round. The M329A2 is freed by rotating it in a clockwise direction.

WARNING

During peacetime live-fire training, all personnel, except the gunner, move at least 50 meters to the rear of the mortar or carrier.

(2) If the round slid completely or partly down the barrel (not visible or only the fuze is visible), the gunner stands behind the barrel and kicks it sharply several times with the heel of his boot.

WARNING

During peacetime live-fire training, if the round does not fire, the gunner joins the crew and waits one minute to avoid personal injury due to a cookoff. After waiting one minute, the gunner then returns to the mortar and tests the barrel for heat. When the barrel is cool enough to handle, the gunner signals for the rest of the crew to come forward.

(3) If kicking the barrel does not dislodge the round, the gunner waits until the barrel is cool enough to handle with bare hands (he checks for heat with his fingertips from the muzzle to base plug). The barrel may be cooled with water or snow. If the barrel is not cool enough to handle, the gunner waits one minute to avoid an accident from a hangfire or the ignition cartridge and possible damage to the barrel from rapid quenching during cooling.

Note: If temperature is above 32 degrees, a minimum of three quarts of water is used. If temperature is below 32 degrees, a solution of two quarts of water and two quarts of antifreeze is used.

WARNING

The water or water and antifreeze cushions the impact of the round onto the firing pin should a stuck round dislodge during the removal operation. This prevents the primer from functioning. The round will not be refired.

(4) The gunner lifts the container of water or water and antifreeze from behind the barrel and pours the entire amount slowly into the barrel. If only water is used, a 2-minute wait is allowed to let the water flow past the cartridge to the bottom of the barrel. If water and antifreeze is used, a 30-minute wait is allowed to let the water flow past the cartridge to the bottom of the barrel.

WARNING

A stuck round could dislodge and fire as the water or water and antifreeze is being poured into the barrel. All personnel except the gunner will take cover. If carrier-mounted, the ramp of the carrier is closed to protect the gunner. At no time will any part of the gunner's hands or body be placed in front of the muzzle of the barrel.

Note: The gunner moves back with other crew members when water and antifreeze is used to remove the cartridge from the ground-mounted mortar.

WARNING

Keep body and head away from front of the mortar.

b. Removal procedures are described herein.

(1) The gunner locks the firing data on the sight, removes it, and places it in a safe place.

(2) The gunner signals the squad to come forward and removes the sightunit.

(3) The assistant gunner cranks the mortar barrel to its highest position in low range or to its lowest position in high range and backs off two turns.

(4) The gunner traverses the mortar to the extreme left.

(5) The gunner and assistant gunner tilt the mortar barrel, bridge assembly, and standard assembly to the left, allowing the cap assembly trunnion pin to slide up in the slots.

(6) The squad leader and ammunition bearer, without getting behind the mortar barrel, should carefully lift the barrel out of the bridge trunnion socket and rest it on the bridge assembly. The gunner and assistant gunner return the bridge assembly to its original position.

(7) The assistant gunner places his hands around the muzzle, making certain that no part of his hands extend over the muzzle.

(8) The gunner supports the barrel in front of the standard assembly (Figure 6-13) with his right arm around the barrel.

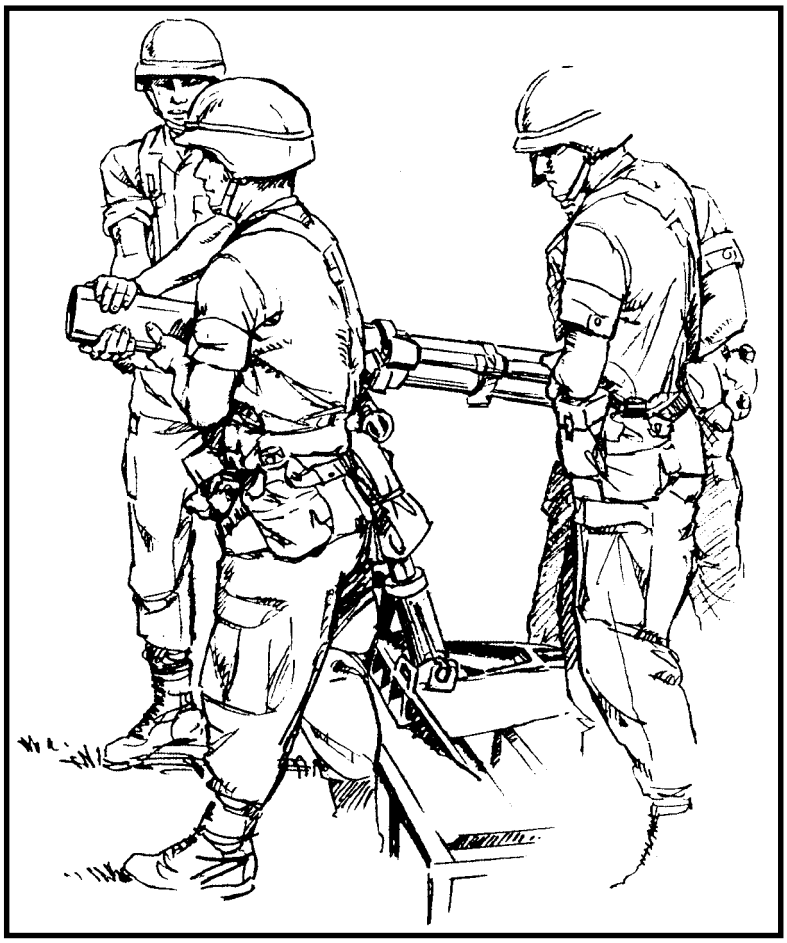

Figure 6-13. Gunner supporting the barrel.

WARNING

Never lower the base of the barrel below a horizontal position until the cartridge has been removed.

(9) The squad leader and ammunition bearer carefully lift the base end of the barrel without getting behind it, and slowly raise it to the horizontal position, while the cartridge moves slowly toward the muzzle.

(10) The assistant gunner extends the thumbs of both hands over the muzzle as the barrel reaches the horizontal position. The squad leader and ammunition bearer continue to raise the rear of the barrel.

WARNING

When removing the cartridge, the assistant gunner does not touch the striker since it may be armed.

(11) The assistant gunner stops the cartridge with his thumbs, removes it, and places it a safe distance from the mortar position as prescribed by local policy (Figure 6-14). Explosive ordnance disposal personnel are notified.

WARNING

Under no circumstances will an attempt be made to refire the round.

Figure 6-14. Assistant gunner removing misfire.

(12) The gunner and ammunition bearer shake the barrel to remove any debris. The barrel is then placed back into the firing position, and the ammunition bearer swabs it.

(13) If another misfire occurs when firing is resumed, the cartridge is removed and the barrel is checked for damage or fouled firing pin.

c. If the cartridge cannot be removed from the barrel (ground-mounted), the crewmembers must follow these procedures:

(1) The gun crew returns the barrel to its horizontal position. The gunner pushes in, rotates, and disengages the mortar locking pin assembly, while supporting the standard assembly. The squad leader, assistant gunner, and ammunition bearer support the barrel, keeping it in the horizontal position.

(2) The squad leader, assistant gunner, and ammunition bearer remove the barrel from the standard assembly. Keeping the barrel horizontal, they place it on the ground in the direction of fire, a safe distance from the mortar. Explosive ordnance disposal personnel are notified.

Note: For more information on the disposition of misfires, see AR 385-63, TM 9-1300-206, or TM 9-1015-215-10.

6-14. DISMOUNTING OF THE MORTAR

To dismount the mortar, the squad leader commands, OUT OF ACTION. Then, the squad follows these procedures:

a. The second ammunition bearer retrieves the aiming posts. The gunner removes the sight, places an elevation of 800 mils and a deflection of 3800 mils on the M53 sightunit and places it in the case.

b. The assistant gunner replaces the muzzle cover.

c. If the mortar barrel is in high range, the assistant gunner places his shoulder under the barrel, unlocks the elevating cam, and gently lowers the barrel to the low range.

d. The assistant gunner disengages the mortar locking pin assembly and raises the barrel with his right shoulder to disengage the mortar from the standard assembly. The ammunition bearer removes the barrel from the assistant gunner's shoulder, then reinserts the mortar locking pin and cants the barrel to the left to disengage the trunnion pins. The squad grasps the base end of the barrel. Both mortarmen (squad leader and ammunition bearer) lift the barrel out of the socket.

e. The assistant gunner lowers the elevating mechanism, positions the connection for the mortar locking pin assembly to the extreme right, and folds the traversing crank to its inoperative position. He then rotates the standard assembly away from the baseplate assembly and lifts up, disengaging the standard base trunnions.

f. The ammunition bearer moves to the spade end of the bridge and elevates it. The squad leader disengages the bridge trunnions from the rotator assembly.

g. As the bridge spade is raised, the gunner removes the sandbags. The gunner and assistant gunner remove the baseplate and rotator assemblies (assembled).

h. The squad leader picks up the aiming posts and sightunit. At the command MARCH ORDER, the squad places the mortar, equipment, and ammunition in the squad vehicle and trailer.

Section IV. MORTAR CARRIERS, M106, M106A1, AND M106A2

This section is a guide for training mortar units equipped with the M106, M106A1, and M106A2 mortar carriers for mounting the 4.2-inch mortar, M30. The procedures and techniques for a mounted mortar are different from ground-mounted.

6-15. DESCRIPTION

The M106 carrier (Figure 6-15) is the M113 armored personnel carrier modified to carry the 4.2-inch mortar, M30, on a specially designed mount (Figure 6-16). It is an armored, full-tracked, self-propelled vehicle that can swim streams and small bodies of water. A caliber .50 machine gun is mounted on the cupola for the vehicle commander's use.

a. To fire the 4.2-inch mortar from the carrier, the top plating to the rear of the carrier has a mortar-hatch cover, which is hinged and folds to both sides. The carrier provides limited armor protection for the squad during maneuver. In combat, the mortar is fired with the ramp closed and locked. During firing exercises in training, the mortar may be fired with the ramp open for visual inspection by safety personnel.

b. The mortar and its components can be removed from the carrier for ground-mounted firing. The baseplate, bridge, and rotator assemblies of the ground mount are stowed outside the carrier.

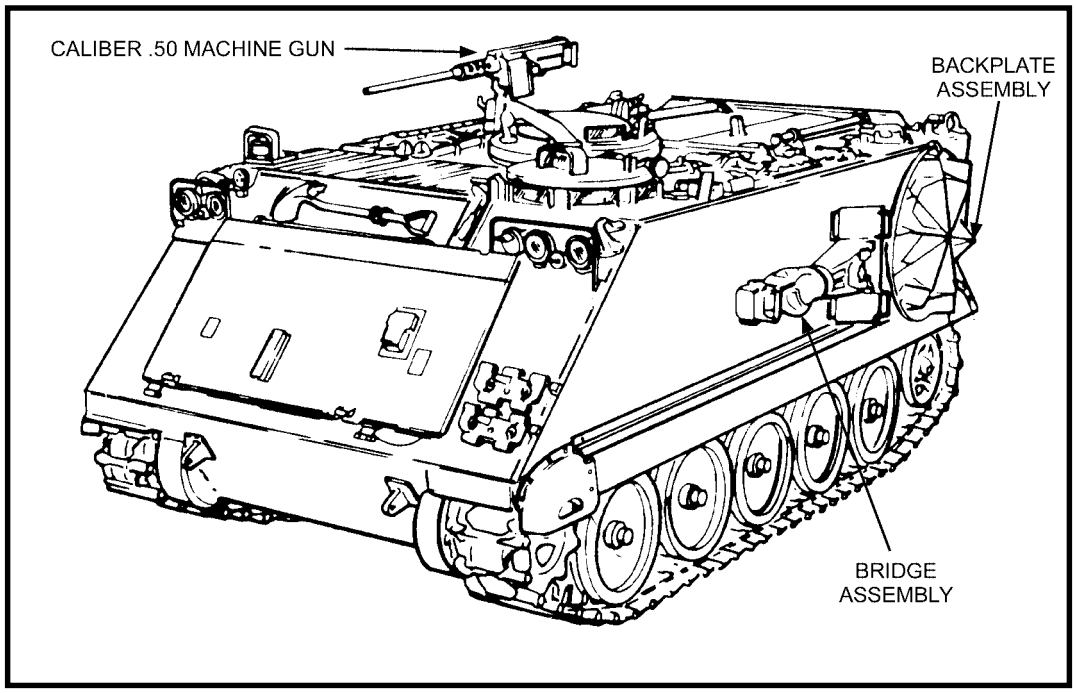

Figure 6-15. Mortar carrier, M106, left front view (caliber .50 machine gun mounted on cupola).

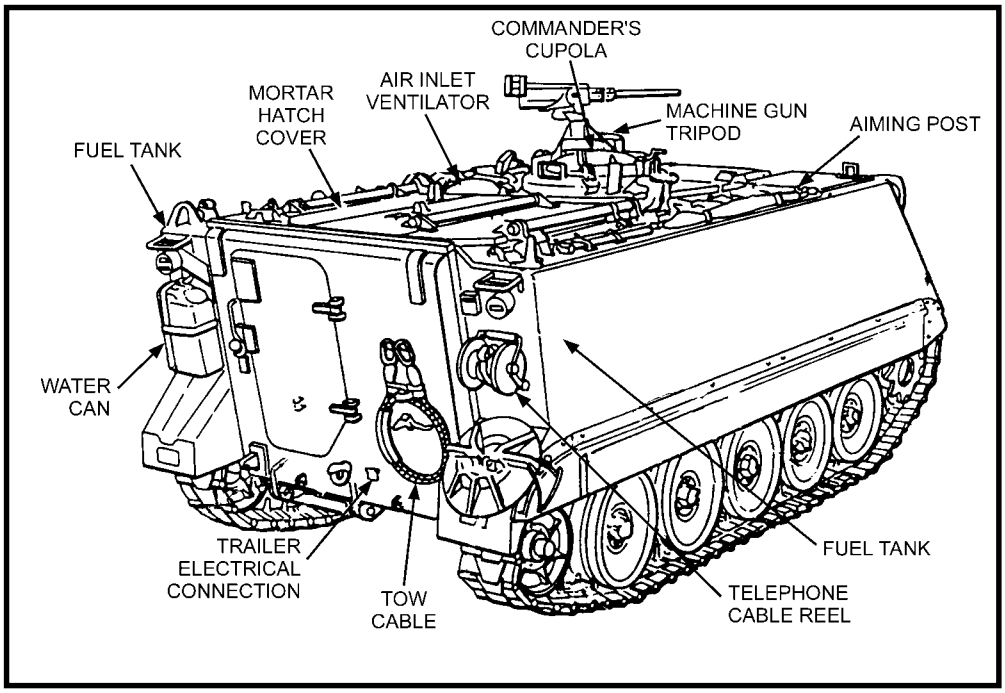

Figure 6-16. Mortar carrier, M106, top rear view.

6-16. TABULATED DATA

The tabulated data of the M106 carrier are as shown in Table 6-2 follows:

GENERAL INFORMATION	**M106**	**M106A1**	**M106A2**
Crew capacity	5	5	6
Weight (pounds):			
Combat load	25,700	26,137	26,876
Airdrop	19,380	19,850	20,589
Ground pressure (psi) (combat weight)	8.2	8.3	8.6
Armament	4.2-inch mortar, M30; .50-caliber machine gun	4.2-inch mortar, M30; .50-caliber machine gun	4.2-inch mortar, M30; .50-caliber machine gun
AMMUNITION STOWAGE			
Mortar, 4.2-inch, M30	93 rounds	88 rounds	88 rounds
.50 Caliber	600 rounds	600 rounds	600 rounds
7.62-mm	720 rounds	720 rounds	720 rounds
Fuzes	54 fuzes	54 fuzes	54 fuzes
MEASUREMENTS (inches)			
Overall length	194	194	194
Maximum width	113	113	105 3/4
Maximum height	87	98	87 1/2
Ground clearance	16	16	17 1/8
FUEL CAPACITY (gallons)	85 gasoline	95 diesel	95 diesel
PERFORMANCE			
Speed (mph):			
Land	40	41.5	40
Water	3.5	3.5	3.6
Grade ability (percent):			
Forward slope	60	60	60
Slide slope	30	30	30
Vertical obstacle (inches)	24	24	24
Trench crossing (inches)	66	66	66
Turning radius (feet):			
Differential steer	22.8	22.8	22.8
Pivot steer	12.8	12.8	12.8
Cruising range (miles)	185	295	300
Fording capability (Do not exceed gross weight rating)	Unlimited	Unlimited	Unlimited
Bilge pump output (gpm)	44	44	44
MORTAR CAPABILITIES MOUNTED ON TURNTABLE	**M106**	**M106A1**	**M106A2**
Traversing limits (mils):			
Right of center with connection for mortar locking pin assembly		825	800
Left of center with connection for mortar locking pin assembly		775	800
Total traverse capability from extreme left to extreme right (mils)		1600	1600
Elevation limits (level track) maximum (mils)		1124	1600
Elevation limits (level track) minimum (mils)		740	1600

Table 6-2. Tabulated data for the M106 carrier.

Section V. OPERATION OF CARRIER-MOUNTED MORTAR

The mortar section is the basic fire unit for the mortar platoon. When a position is occupied, the mortars are emplaced 40 meters apart, making a section front (distance between flank mortars) of about 80 meters. The mortars are numbered 1, 2, and 3 from right to left when facing in the direction of fire, without regard to the permanent squad numbers within the section—for example, the first squad is not necessarily mortar No. 1. The squads of the heavy mortar platoon in the mechanized infantry battalion and tank battalion, whose prime mover is the mortar carrier (Ml06, M106Al, or M106A2), consist of four men: the squad leader, gunner, assistant gunner, and ammunition bearer/driver (Figure 6-17). The differences in the procedures from a ground-mounted mortar squad are also discussed herein.

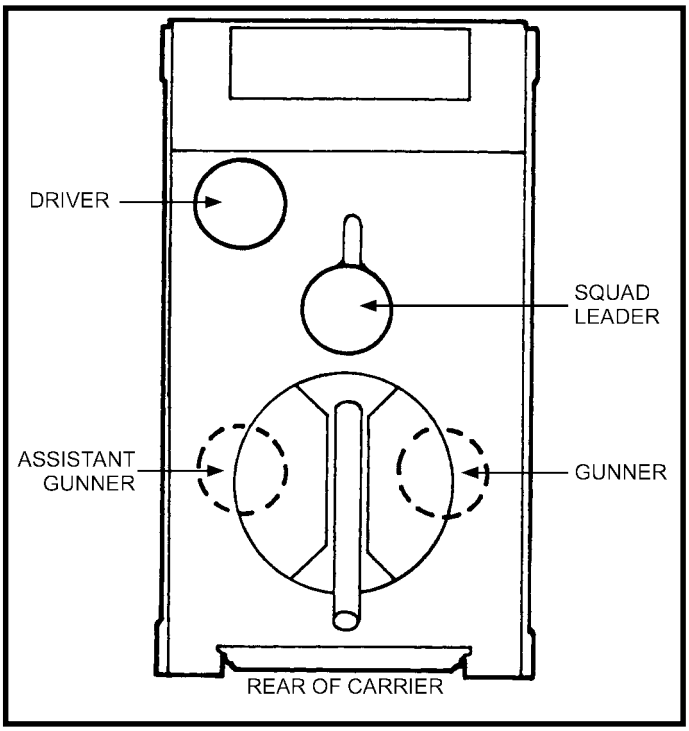

Figure 6-17. Mounted posts.

6-17. MORTAR AND VEHICULAR MOUNT

The mortar is carried while attached to its vehicular mount. A mount tie-down strap is provided to tie the mortar (when it is depressed to its lowest elevation) and the standard base trunnion bearing support (when lowered to its lowest position) (Figure 6-18, page 6-26). The trunnion detent pins at the base assembly are placed in their innermost position. The vehicular mount is locked in position by the turntable traverse lock. Securing the mortar for distant moves is required to prevent damage to the standard assembly recoil and counterrecoil mechanism, and possible injury to personnel. The mortar is provided with a sight extension arm assembly, which is received by the socket of the coupling and sight mount assembly. The gunner uses the sight extension arm to sight on his aiming point above

the hull of vehicle. The sight extension must be removed before movement to prevent wear on the sight mount coupling gears. The vehicular mount supports the mortar and aids in securing the mortar for traveling. The mount consists of the components described in the following paragraphs.

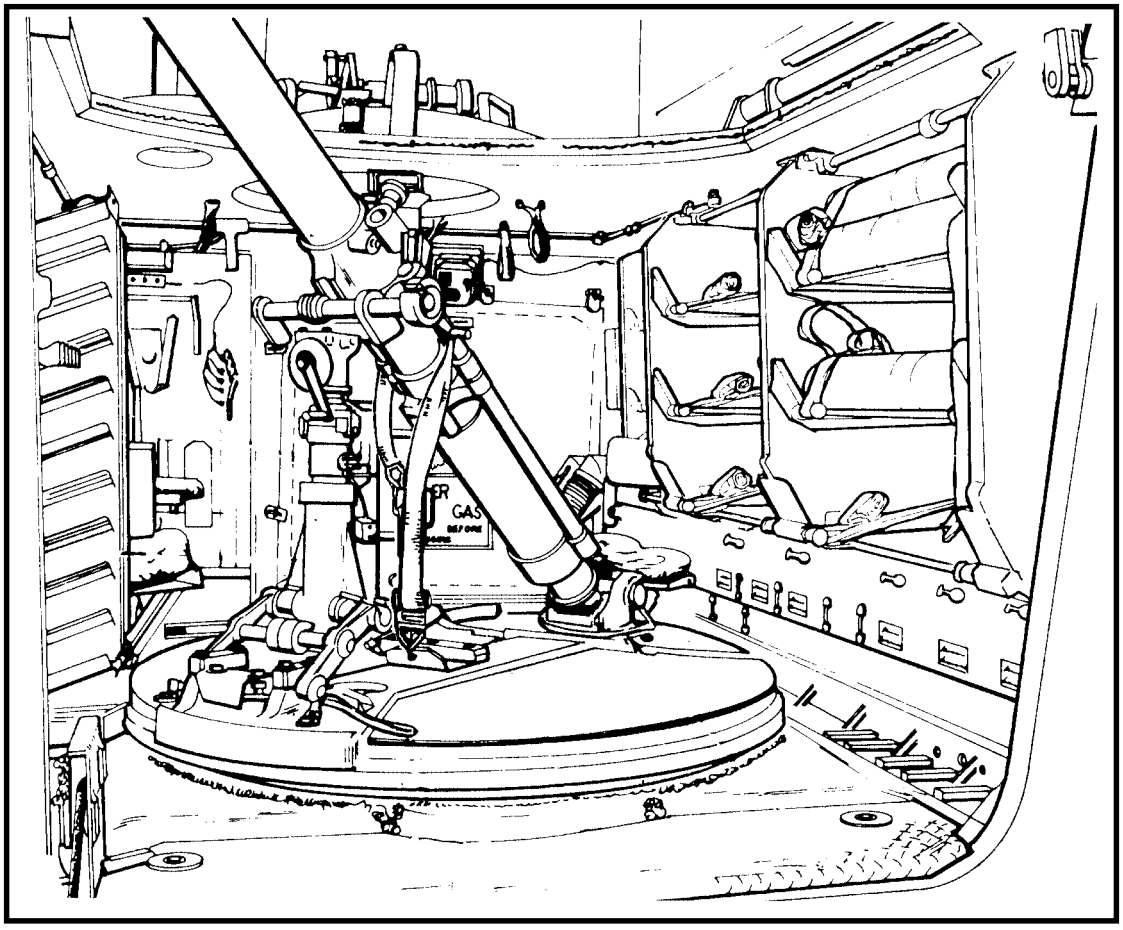

Figure 6-18. Vehicular mount.

a. **Mortar Standard Assembly Support.** The standard assembly support located at the front of the mortar turntable retains the mortar barrel in the firing position. The lock consists of spring-loaded release levers, a catch, and a spring-loaded guard. The catch automatically latches when the mortar and standard assembly are raised to the firing position. To release the catch, raise the guard, step on the release, and lower the mortar barrel and standard assembly.

b. **Traverse Locking Handle.** The traverse locking handle, located in the center of the mortar turntable, locks the turntable to the indexing ring during mortar firing. To engage the lock, push the handle down until the latch automatically engages. To release the lock, raise the latch and pull up the locking handle.

c. **Traversing Straps.** These two straps are used to help traverse the turntable when it must be forced into position.

d. **Mortar Barrel Socket Assembly.** The socket assembly, located at the rear of the mortar turntable, receives and retains the barrel with detent pins—one on each side of the socket. The pins have two detent positions. To insert the barrel, the pins must be pulled to their outermost detent position. To retain the barrel, the pins are pushed to their innermost detent positions.

e. **Mortar Tie-Down Strap.** The mortar tie-down strap is located on the mortar turntable. When not in use, the strap is stowed in the mortar equipment bag. The strap consists of a ratchet buckle with a hook on the lower and upper ends, with a D-ring attached in the center section. The strap is used to secure the mortar during travel. To install the strap, the ratchet end is hooked into the eye on the turntable, the upper end is wrapped around the barrel between the coupling and sight mount assembly, and the hook is fastened to the D-ring. The ratchet handle is operated up and down until the strap is tight. To loosen, the handle is opened all the way, the release latch is depressed, and the tie-down strap is pulled on.

f. **Recoil Stop Clamp.** The recoil stop clamp is a hinged collar installed on the standard assembly during on-vehicle mortar firing. This clamp prevents the barrel from being accidentally depressed beyond safe limits (Figure 6-19).

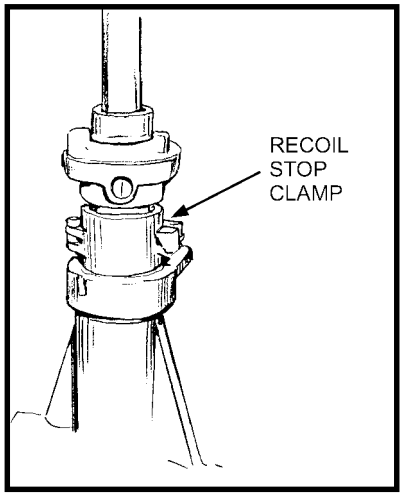

Figure 6-19. Recoil stop clamp.

6-18. MAINTENANCE

Care and cleaning of the mortar, instruments, and equipment are the duty and responsibility of the mortar squad. Care and cleaning of the carrier-mounted mortar are the same as for the ground-mounted mortar. All maintenance records for the mortar and carrier are kept IAW the instructions outlined in TM 38-750-1.

Note: See TM 9-1015-215-20&P for cleaning and lubricating procedures for the 4.2-inch mortar, M30, and the mount, M24Al. For maintenance procedures for the M106, M106A1, and M106A2 carriers, see TM 9-2300-257-10.

6-19. PLACEMENT OF MORTAR INTO FIRING POSITION ON CARRIER

This exercise should begin with the mortar and crew mounted in the carrier (Figure 6-20, page 6-28). The purpose of this exercise is to get the mortar into a firing position to be reciprocally laid, or to engage a target using the direct lay method. The driver leaves the engine running. The intercom between the driver and squad leader is maintained so that the squad leader can direct the driver to move the carrier for the first deflection reading in reciprocal laying. To mount the mortar in the firing position, the squad leader gives the preparatory command PREPARE FOR ACTION, and the mortar squad takes the following actions.

a. The gunner moves to the center hatch cover chain and grasps the chain. The assistant gunner moves the left mortar hatch cover chain and grasps the chain. The ammunition bearer picks up the sightunit case. When the squad is ready, the squad leader commands ACTION.

b. On the command ACTION, the gunner and assistant gunner unlock, fold, and lock the hatches. The gunner then unlocks, folds, and locks the right hatch cover into its fully open position.

c. After the assistant gunner has locked the left hatch, he picks up the sight extension and passes it to the gunner. The gunner places the sight extension on the mortar and adjusts it to his height.

d. The gunner removes the sightunit from its case, places a 3200-mil deflection and 900-mil elevation on the sight, and places it into the sight socket of the extension.

e. The assistant gunner releases the tie-down strap ratchet and removes the strap. He then moves to the front of the mortar, places his right shoulder under the mortar, and pushes up until the standard support locks in the raised position. He then elevates the mortar about 15 turns.

f. The assistant gunner removes the muzzle cover. The gunner and assistant gunner cross-level the mortar and level it for elevation. The ammunition bearer ensures that the detent pins are in their innermost detent position.

g. The gunner then announces, “Up,” and the squad leader signals up to the instrument operator. At this time, the crew should be at the firing post.

h. The squad is now ready to reciprocal lay or to engage a target by the direct lay method.

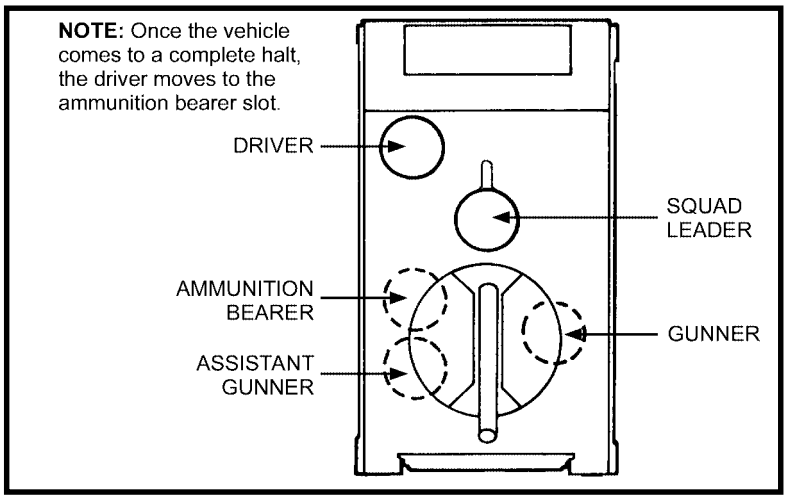

Figure 6-20. Mounted firing posts.

6-20. LAYING FOR DEFLECTION AND ELEVATION

This procedure demands coordination and numerous exercises. The turntable must be properly adjusted and lubricated. The squad should know that the traversing turntable straps are used only when the turntable must be forced into position. The connection for the mortar locking pin assembly normally is within two turns of center after properly being laid. Two and one half turns may exist because of the 50-mil interval between the teeth of the turntable traversing ring. This procedure is the same as for the ground-mounted mortar with the following exceptions.

a. **Large Deflection Shifts to the Left.**

(1) When a deflection greater than 75 mils is announced in the fire command, the assistant gunner prepares the turntable to be traversed before firing the round.

(2) As soon as the deflection is announced, the gunner immediately indexes it on the sight (Figure 6-21). He ensures that the mortar is within two turns of center of traverse.

(3) The assistant gunner pushes down on the turntable traversing handle latch with his left foot. He then raises the handle to the unlocked position and assumes the following position: right foot on the standard support, left foot on the mortar tube socket assembly, right and left hands on the rim of the mortar hatch cover, and body braced on the fuze rack (Figure 6-22, page 6-30).

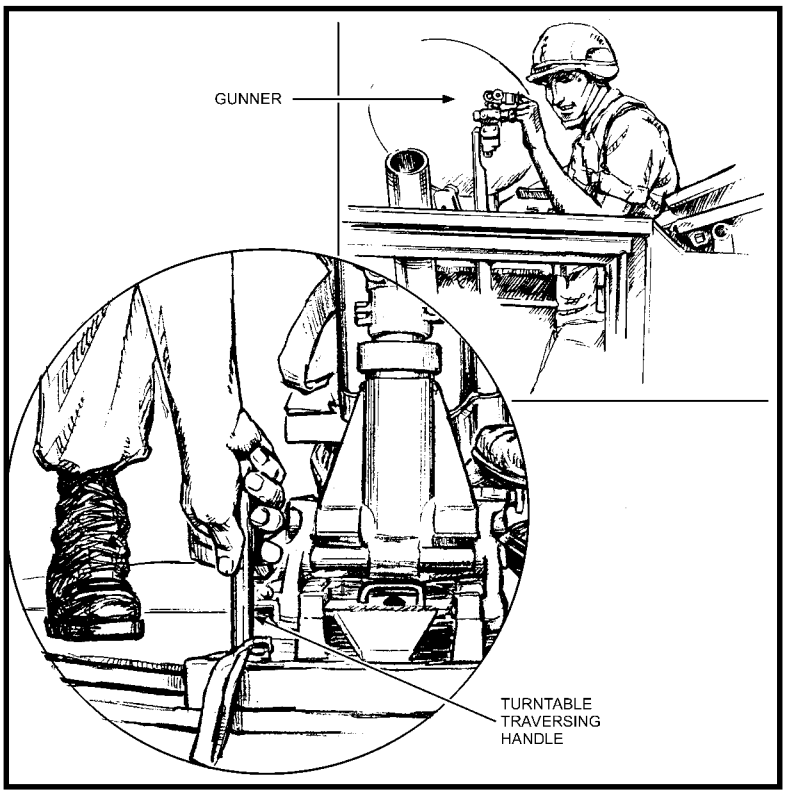

Figure 6-21. Gunner indexing the sight and assistant gunner unlocking the turntable traversing handle.

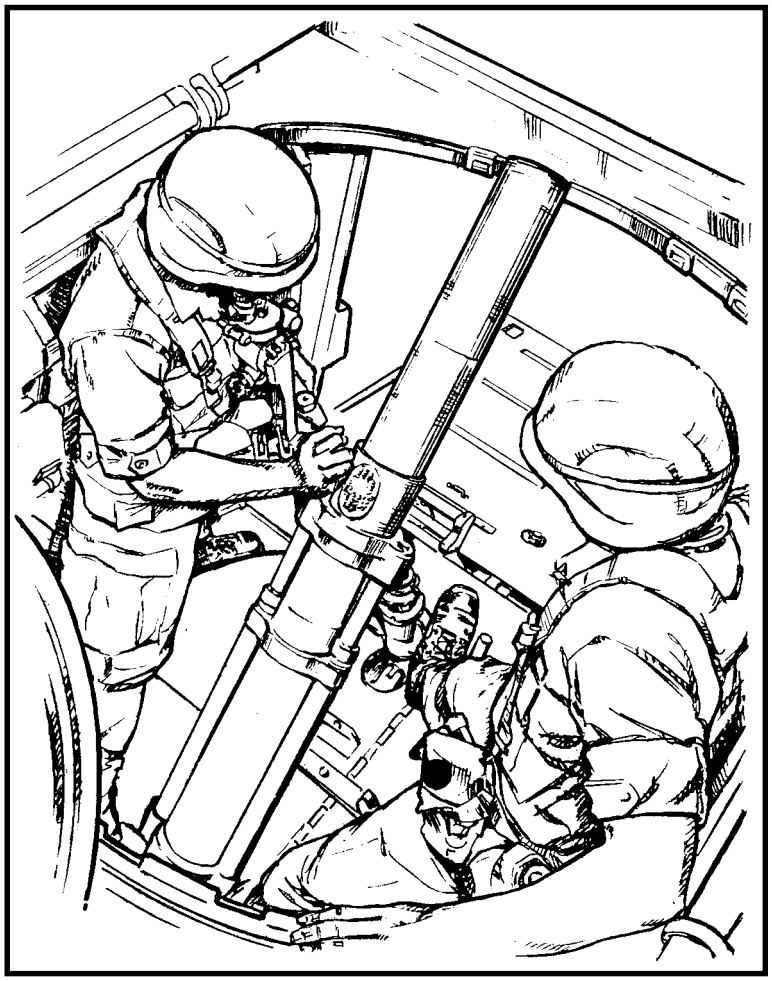

Figure 6-22. Positions for traversing the turntable.

(4) The gunner assumes the following position: right foot near or on the mortar tube socket assembly, left foot off the turntable, right hand on top of the coupling and sight mount assembly, and left hand on the traversing crank. At the same time, he looks through the telescope of the M53- or M64-series sightunit (Figure 6-22).

(5) The gunner commands PUSH. At this time the assistant gunner pushes the turntable with his right foot; and the gunner pushes with his right foot and pulls with his right hand.

(6) When the gunner has the approximately correct sight picture, he commands HOLD. Upon confirming this sight picture, he commands LOCK.

(7) The assistant gunner locks the traversing lock handle with his right hand (Figure 6-23) or right foot. (The gunner does not attempt to finalize his sight picture before the assistant gunner locks the turntable.)

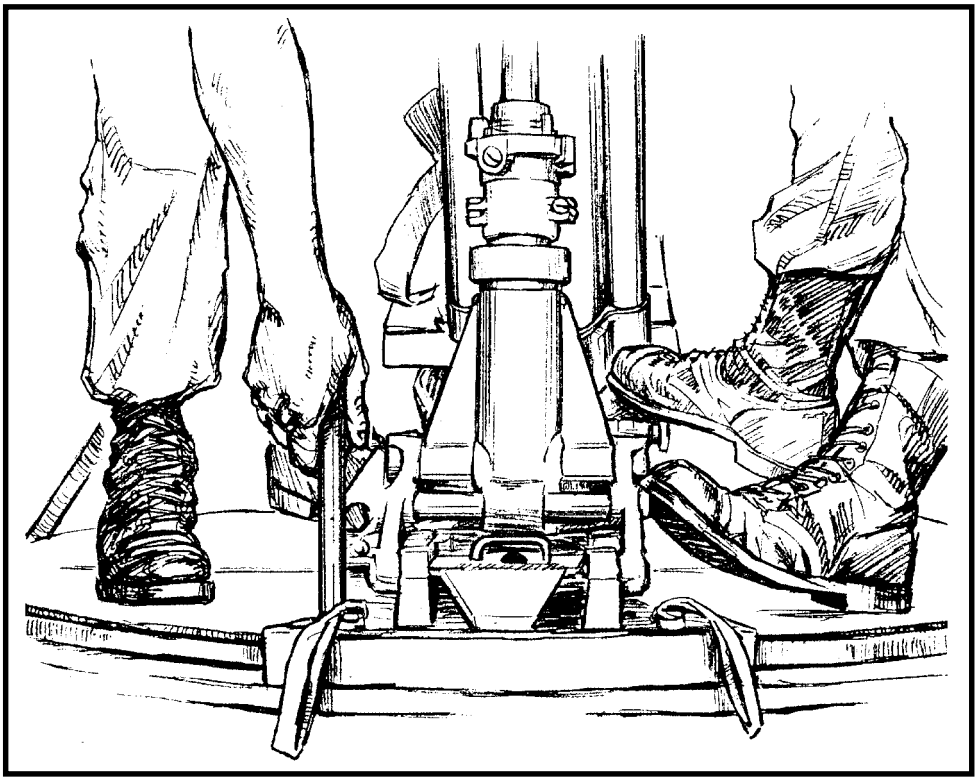

Figure 6-23. Assistant gunner locking the turntable traversing handle.

(8) The gunner and assistant gunner continue to lay the mortar for deflection and elevation using the operating mechanism on the mortar.

(9) When the mortar is correctly laid, the gunner announces, "Up," or commands FIRE.

b. **Large Deflection Shifts to the Right.** This exercise is the same as large deflection shifts to the left with the following exceptions:

(1) The gunner reverses the position of his feet on the turntable. His right foot is off the turntable and his left foot is on or near the standard support.

(2) When the turntable has been unlocked, the gunner commands PULL.

(3) The gunner and assistant gunner push the turntable with their left feet.

6-21. REMOVAL OF A MISFIRE (CARRIER-MOUNTED)

During firing, the first crew member who notices a misfire has occurred announces, "Misfire."

a. Procedures for removal of a cartridge when the barrel is carrier-mounted as described herein.

(1) The entire crew remains with the mortar.

WARNING

During peacetime live-fire training, when the water and antifreeze is used, the gunner joins the crew and waits the prescribed time. After waiting, the driver mounts the carrier first and then the gunner second.

(2) The gunner closes the ramp door. The driver lowers the ramp. The gunner signals the crew to mount the carrier.

(3) The driver moves to the left of the mortar, the squad leader moves to the right of the mortar, and the gunner and assistant gunner are in the firing positions. If the mortar is not centered, the gunner and assistant gunner now center the mortar toward the rear of the carrier.

(4) The gunner uses the traversing handwheel to center the mortar. The gunner removes the sight extension with the sightunit attached and places it on the carrier roof.

(5) The assistant gunner then elevates or depresses the mortar barrel to its lowest position in high range or to its highest position in low range (minus two turns). The gunner and assistant gunner must support the barrel while it is being lowered.

(6) The assistant gunner places his hands around the muzzle, making certain that no part of his hands extend over the muzzle. The gunner supports the barrel in front of the standard assembly.

WARNING

Never lower the base of the barrel below a horizontal position until the cartridge has been removed.

(7) The ammunition bearer removes the two detent pins. Then the squad leader and ammunition bearer carefully lift the base end of the barrel (without getting behind the barrel) and slowly raise it to the horizontal.

(8) The assistant gunner extends the thumbs of both hands over the muzzle as the barrel reaches the horizontal position. While the cartridge moves slowly toward the muzzle, the squad leader and ammunition bearer continue to raise the rear of the barrel.

WARNING

When removing the cartridge, the assistant gunner must not touch the striker since it may be armed.

(9) The assistant gunner stops the cartridge with his thumbs, removes it, and places it a safe distance from the mortar position (as prescribed by local policy). The squad leader and ammunition bearer shake the barrel to remove any debris. The barrel is then placed back into the firing position and the ammunition bearer swabs the barrel. Explosive ordnance disposal personnel are notified.

b. If the cartridge cannot be removed from the carrel (carrier-mounted), the crewmembers must follow these procedures:

(1) The gun crew returns the barrel to its horizontal position. The gunner pushes in, rotates, and disengages the mortar locking pin assembly, while supporting the standard assembly. The squad leader, assistant gunner, and ammunition bearer support the barrel, keeping it in the horizontal position.

(2) The squad leader, assistant gunner, and ammunition bearer remove the barrel from the standard assembly. Keeping the barrel horizontal, they place it on the ground in the direction of fire, a safe distance from the mortar. Explosive ordnance disposal personnel are notified.

Note: For more information on the disposition of misfires, see AR 385-63, TM 9-1300-206, or TM 9-1015-215-10.

6-22. MOUNTING OF MORTAR ON CARRIER FROM GROUND-MOUNTED POSITION

With the weapons system already out of action, the driver first ensures it is safe to lower the ramp and then does so.

a. The gunner and assistant gunner open the mortar hatch cover and ensure the turntable is centered to the rear of the track and locked. At the same time, the squad leader ensures that the detent pins are in their outermost detent positions.

b. With the gunner at the muzzle end of the mortar and the driver and squad leader at the base end of the mortar, they move the barrel into the carrier, base end first. The driver and squad leader place the tube cap trunnion pins into the tube socket, aligning the tube cap trunnion pin.

c. The gunner raises the muzzle end of the mortar high enough for the assistant gunner to mount the standard assembly. The assistant gunner aligns the standard base trunnion with the standard trunnion socket of the standard support, ensuring that the standard assembly is leaning toward the rear of the track when the trunnions are seated in the trunnion bearings. He then moves the standard assembly to the vertical position and supports the standard assembly.

Note: If the above procedures are not followed, the standard assembly can be emplaced improperly, causing undue stress on the standard support assembly.

d. The gunner lowers the barrel, aligning the locking lugs and standard assembly, pushes in the mortar locking pin assembly and turns it 180 degrees in either direction, locking the barrel to the standard assembly. He then ensures that the connection for the mortar locking pin assembly is centered, and that the standard assembly is fully depressed.

e. The assistant gunner secures the muzzle cover and tie-down strap, and places the muzzle cover on the barrel. He then hooks the ratchet end of the tie-down strap to the eye on the turntable and wraps the upper end around the barrel between the coupling and sight mount. After fastening the hook to the D-ring, he operates the ratchet until the strap is tight.

f. The bridge and baseplate assemblies are mounted by the gunner, the assistant gunner, and the driver. One mortarman always manipulates the bridge clamping assembly or baseplate locking clamp and, at the same time, aids in bracing these components. The rotator assembly is placed in its position on the right rear of the carrier.

g. The mortar and its components are now secured in the traveling position (Figure 6-19).

6-23. DISMOUNTING OF MORTAR FROM CARRIER

A minimum of four mortarmen is required to remove the mortar and standard assembly from the travel position.

a. The driver ensures it is safe to lower the ramp and then does so. He joins the squad leader located at the base end of the mortar.

b. The assistant gunner removes the tie-down strap and muzzle cover from the mortar and stows them in the equipment bag. He then moves to the front of the mortar to support the standard assembly.

c. The gunner unlocks the mortar locking pin and lifts up on the front of the mortar. The assistant gunner leans the standard assembly forward and removes it. The driver pulls the detent pins to their outermost detent positions.

d. With the driver and squad leader at the base end of the barrel and the gunner at the muzzle end, they remove the barrel from the carrier.

e. If the mortar is to be ground-mounted at this time, the crew removes the bridge, rotator, and baseplate assemblies from the carrier. The mortar is then mounted the same as in the previous paragraph.

6-24. PREPARATION FOR A MARCH ORDER FROM GROUND-MOUNTED POSITION

This exercise begins with the squad members at their firing posts at the ground-mounted mortar (Figure 6-24) and with the ramp of the carrier lowered. The preparatory command is PREPARE FOR MARCH ORDER; the command for execution is MARCH ORDER, upon which the crew proceeds as follows.

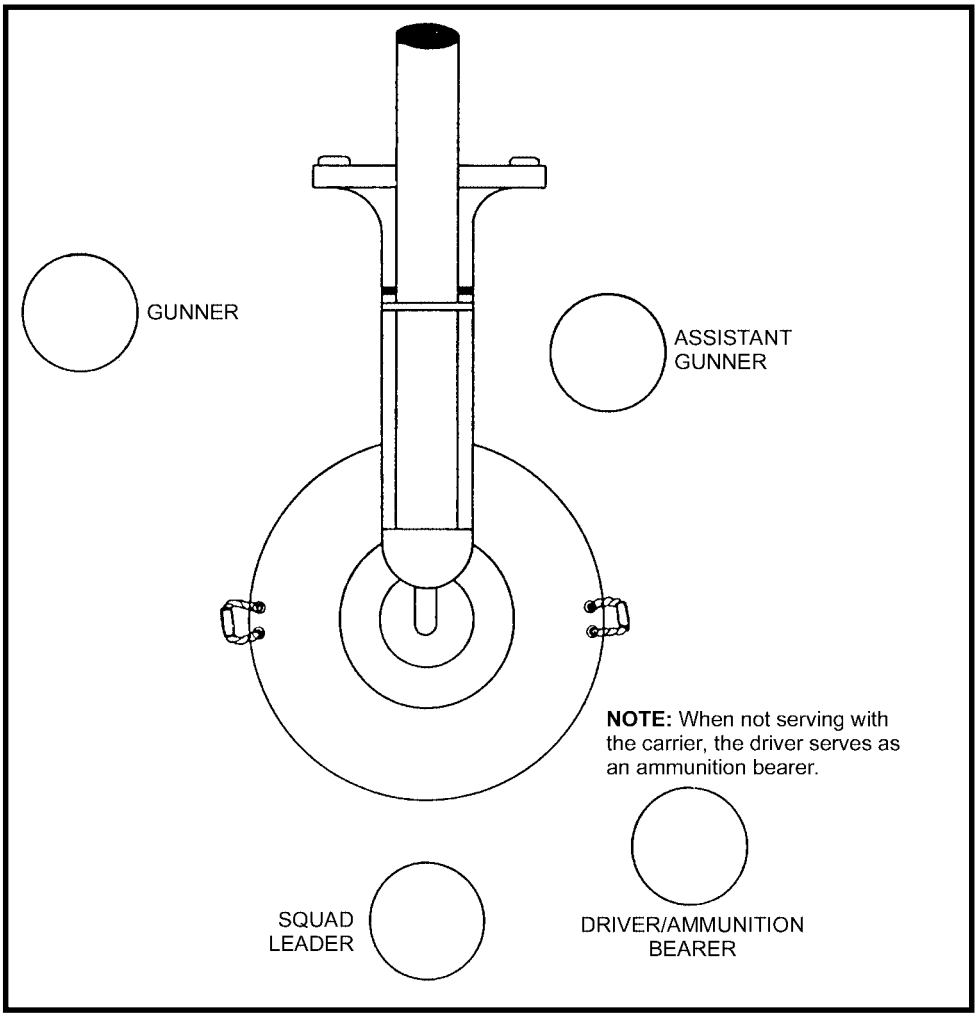

Figure 6-24. Firing posts (squad and mortar dismounted from carrier).

Note: When not serving with the carrier, the driver serves as an ammunition bearer.

a. **Squad Leader.**

(1) Receives the sight from the gunner, places it in the sight case, and stows the case in the carrier.

(2) Supervises the mounting of the mortar and the storing of the ammunition.

(3) Directs the driver in the closing of the ramp.

(4) Takes his mounted post.

(5) Connects the breakaway plug.

(6) Commands REPORT.

(7) When the carrier is prepared for march order, reports, “Number one (two, three, or four); ready for march order.”

b. **Gunner.**

(1) Removes the sight and hands it to the squad leader.

(2) Disconnects the barrel from the standard assembly.

(3) Assists the ammunition driver/bearer and the driver in carrying and mounting the barrel.

(4) Assists the assistant gunner in placing the mortar in the traveling position.

(5) Assists the driver and assistant gunner in replacing the bridge and baseplate assemblies.

(6) Assists the ammunition bearer/driver in carrying and stowing ammunition.

(7) Assists in closing the mortar hatch cover.

(8) Takes his mounted post.

(9) Reports, "Gunner ready."

c. **Assistant Gunner.**

(1) Swabs out the bore.

(2) Mounts the recoil stop on the standard assembly.

(3) Assists the ammunition bearer and gunner in carrying and stowing the baseplate and bridge assemblies.

(4) Assists the gunner in placing the mortar in the traveling position.

(5) Dismounts and mounts the standard assembly.

(6) Attaches and tightens the traveling strap assembly to the mortar.

(7) Stows the cleaning staff and places the muzzle cover on the barrel.

(8) Assists the ammunition bearer in carrying and stowing ammunition.

(9) Assists in closing the mortar hatch cover.

(10) Takes his mounted post.

(11) Reports, "Assistant gunner ready."

d. **Driver.**

(1) On command of the squad leader, raises and lowers the ramp.

(2) Moves the carrier as directed by the squad leader.

(3) Stows the rotator assembly.

(4) Assists the gunner and assistant gunner in mounting the mortar.

(5) Takes his mounted post.

(6) Reports, "Driver ready."

(7) Assists the gunner and assistant gunner in dismounting, carrying, and stowing the bridge and baseplate assemblies.

(8) Retrieves the aiming post.

(9) Places the detent pins in the innermost detent.

6-25. SAFETY CHECKS

Specific safety checks must be performed before firing from the M106, M106Al, or M106A2 carrier. Most checks can be made by visual inspection. The gunner, assistant gunner, and ammunition bearer are responsible for physically performing these safety checks under the squad leader's supervision. The squad leader supervises to ensure that all precautions are taken to prevent possible damage to equipment or injury to personnel.

a. **Gunner Safety Checks.**

(1) The trunnion detent pins are in the innermost detent.

(2) The traversing lock handle is locked.

(3) The standard support assembly is in a raised position and firmly latched.

(4) The standard base trunnions are correctly aligned and seated in the standard support trunnion bearing.

(5) The elevating mechanism cam is locked and operational.

(6) The recoil stop is in position and the wing nut is tight.

(7) The mortar locking pin is fully seated and locked.

(8) A mask and overhead clearance exist through the entire traverse capability of the mortar mounted on the carrier.

(a) When a mask and overhead clearance do not exist at points along the full traverse and elevation capability of the mortar, the gunner traverses the barrel (using the turntable when necessary) and, by sighting along the barrel, aligns the barrel with the obstruction. Using the sight, he then measures the elevation, refers the sight back to the aiming posts, and takes a correct sight picture.

(b) When referring back to sight, he measures the number of mils, left or right, that the mask or overhead obstruction covers and announces the result to the squad leader.

(9) The two mortar hatch covers are securely latched.

b. **Assistant Gunner Safety Checks.**

(1) The mortar barrel is clear of foreign materials.

(2) The bore is swabbed before firing, and after every 10 rounds or fire for effect.

(3) The left mortar hatch cover is securely latched.

c. **Ammunition Bearer Safety Checks.**

(1) The rounds are clean and free of burrs.

(2) The fuze is screwed tightly against the shell body. If the fuze is loose, he tightens it with the correct fuze wrench.

(3) The correct charge is placed on each round and the propelling charges are properly positioned.

(4) The striker nut is tight.

(5) The proper fuze option or fuze time setting is selected.

6-26. MEASUREMENT OF MINIMUM AND MAXIMUM ELEVATIONS

When in a firing position, mortar carriers should be positioned on the best obtainable level ground. If the carriers are not on level ground, the mortars may not be able to fire at certain elevations because of the longitudinal cant of the carrier. When the carrier is positioned, the gunner measures the minimum elevations that can be obtained on his mortar by elevating and depressing the mortar barrel and measuring with his sight. He gives the results of his measurements to the squad leader who in turn informs the FDC. The FDC then determines which constant elevation to fire and may direct the squad leader to move his carrier to a new position.

Note: The sight must be calibrated before minimum and maximum elevations are measured.

6-27. SQUAD FORMATIONS

This paragraph discusses the traveling and firing positions of the squad members.

a. **Traveling Posts.** The squad takes traveling posts as follows:

(1) Squad leader: in the cupola, standing on the platform or seated on the cupola seat.

(2) Gunner (No. 1): on the gunner’s seat, facing the assistant gunner (No. 2).

(3) Assistant gunner (No. 2): on the assistant gunner's seat, facing the gunner.

(4) Driver: in the driver's seat.

b. **Firing Posts (Mounted).** When the carrier-mounted mortar is prepared for action, the squad members take their firing positions as follows:

(1) Squad leader: any position in the carrier that allows him to supervise the action of the squad.

(2) Gunner (No. 1): to the left of the mortar where he can lay for elevation and direction.

(3) Assistant gunner (No. 2): to the right of the mortar where he can load the mortar and cross-level the sight for the gunner.

(4) Driver: in the driver's seat or the seat next to the vertical ammunition rack.

c. **Firing Posts (Dismounted).** When the mortar is ground-mounted and prepared for action, the squad members take their firing posts. The driver remains with the carrier.

6-28. DISMOUNTED MORTAR SQUAD

This exercise (Figure 6-25) begins with the squad members at their traveling posts with the ramp and ramp door closed. The preparatory command is PREPARE TO DISMOUNT; the command of execution is DISMOUNT. A mounted squad drill should be practiced under section and squad control.

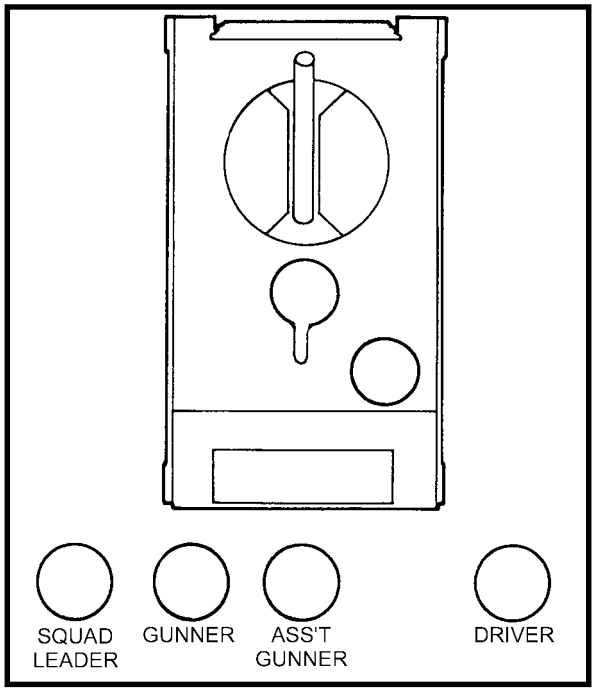

Figure 6-25. Dismounted posts.

a. At the command PREPARE TO DISMOUNT, the driver disconnects the breakaway plug and turns off the master switch. The squad leader disconnects the breakaway plug and turns off the radio. The assistant gunner unlatches and opens the ramp door.

b. At the command DISMOUNT, the assistant gunner, gunner, squad leader, and driver (in that order) dismount, move to the front of the carrier, and take their dismounted posts. Squad members move around the carrier using the fastest route available.

6-29. RECIPROCALLY LAYING THE MORTAR CARRIER SECTION

When fully trained, the mortar squad increases the speed and accuracy of the section functioning as a unit.

a. The procedure for laying the carrier-mounted mortar parallel on the mounting azimuth is the same as for the ground-mounted mortar, with the following exceptions:

(1) When the first deflection is given to the mortars identifying the aiming point, all carrier engines are running.

(2) Intercom between the gunner and drivers is maintained until the carriers cease further pivots. The connection for the mortar locking pin assembly is centered or is within two turns of center. The mortars are centered on the rear of the carriers and the correct sight pictures are on the aiming point. At this time, the carrier engines are turned off.

b. When a reconnaissance of a position has been made and is known by at least one member of the platoon, the procedure for laying the carrier-mounted mortars parallel on the mounting azimuth is as follows (ramps are always up for this exercise):

(1) The instrument operator, if not already in position, dismounts from the command post carrier and positions his instrument 75 meters to the front, right front, or left front of the area occupied by the carriers. He then orients the aiming circle on the mounting azimuth. He swings the aiming circle telescope, by using upper motion, in the general direction of the mortar carriers and awaits the signal from the squad leader when ready to be laid for direction. The instrument operator reciprocally lays the mortar squad upon signal from the first squad leader (normally the base squad) ready to be laid for direction.

(2) As soon as the base squad is positioned, the squad leaders align their respective squads: first squad 40 meters to the right of the base squad; and third squad 40 meters to the left of the base squad (left and right are given in relation to the direction of fire). All squad leaders note the alignment of the base squad and direct their drivers by intercom to pivot, aligning their respective carriers parallel to the base squad.

(3) The squad leaders then command PREPARE FOR ACTION. While the gunners and assistant gunners are placing the mortars into the firing positions, the squad leader is carrying the aiming posts, dismounting from the carriers through the ramp door, latching the door from the outside, and moving half the distance between their carriers and the instrument operator to relay commands.

(4) As soon as the gunners command UP, the squad leaders signal to the instrument operator I AM READY.

(5) On the command UP, the gunners immediately refer their sights to the aiming point, even though the command AIMING POINT THIS INSTRUMENT has not been given. The gunners are up when the connection for the mortar locking pin assembly is centered; the mortars are centered to the rear of the carriers; the sights are set at elevation 900 and 3200 deflection (zero with the M64-series); and the cross-level and elevation bubbles are centered.

(6) When the first deflection command is given, the gunners then index the sights at the given deflection and note the direction the telescopes move. They look through the telescopes and signal to the drivers (who should be observing) the direction to pivot the carrier. The

gunners may give this direction over the intercom to the drivers as a command PIVOT RIGHT (LEFT) and terminate the pivot by the command HALT. The gunners finalize the lay on the aiming point with all bubbles centered, ensuring that it does not take in excess of two turns to lay on the aiming point. The gunners then signal the drivers to cut the carrier engines. The gunners may transmit this signal to the drivers as a command CUT ENGINE.

(7) The instrument operator successively lays each squad. The carrier-mounted mortars are properly laid on the mounting azimuth when the connection for the mortar locking pin assembly is within two turns of center; the mortars are centered to the rear of the carriers; the last deflection given by the instrument operator is on the sights; all bubbles are centered; and the last sight picture obtained by the gunners is on the optical center of the aiming point.

(8) Without command, the gunners refer the sights to the deflection 2800 and direct the squad leaders in aligning the aiming posts. If any other referred deflection is to be used, the instrument operator announces this deflection before laying the mortar squads.

Section VI. AMMUNITION

This section implements STANAG 2321 and QSTAG 900 Edition 1.

Ammunition for the 4.2-inch mortar, M30, is issued in the form of semi-fixed complete rounds. A complete round of ammunition composes all of the ammunition components required to fire the round. For mortar ammunition, this includes a loaded projectile propelling charge to develop the required gas pressure to propel the projectile to its target, primer to initiate the burning of the ignition charge that ignites the propelling charge, and fuze to cause the projectile to function at the time and under the conditions desired. Semi-fixed ammunition is characterized by an accessible propelling charge that can be adjusted for firing. The propelling charge consists of an ignition cartridge and 41 propellant increments (39 for M329A2) assembled in a bag and sheets. To adjust the charge, the individual increments are removed from the cartridge container or cartridge container extension.

6-30. CLASSIFICATION

The 4.2-inch mortar ammunition is stabilized in flight by rotation rather than by fins as in the case of the 60-mm and 81-mm mortar ammunition (Table 6-3, page 6-42).

a. **Identification.** Ammunition is identified by the markings on the original packing containers, which includes the ammunition lot number. Once removed from its packing, ammunition can also be identified by its color and markings.

Note: For further information concerning identification, model designation, lot number, painting and markings, and weight zones, refer to TM 9-1300-200. For the NATO color-coding standard, refer to TB 9-1300-256 and TB 34-9-93.

b. **Type.** Depending on the type of projectile filler, ammunition is classified as high explosive (HE), smoke (PWP or WP), or illumination (Figures 6-26 to 6-28.)

Note: For detailed information on mortar ammunition, see TM 9-1015-215-10, TM 9-1300-200, TM 9-1300-206, TM 43-0001-28, and FT 4.2-H-2.

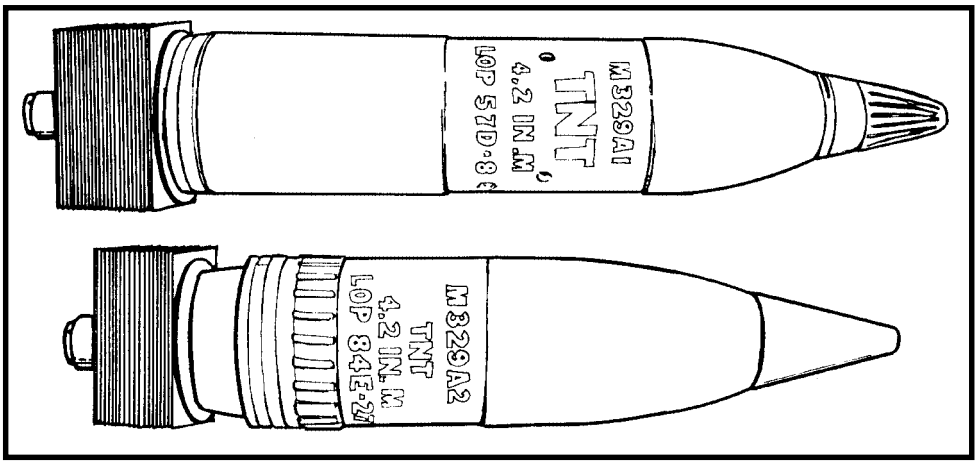

Figure 6-26. High-explosive 4.2-inch cartridges, M329A1 and M329A2 showing supplemental charge.

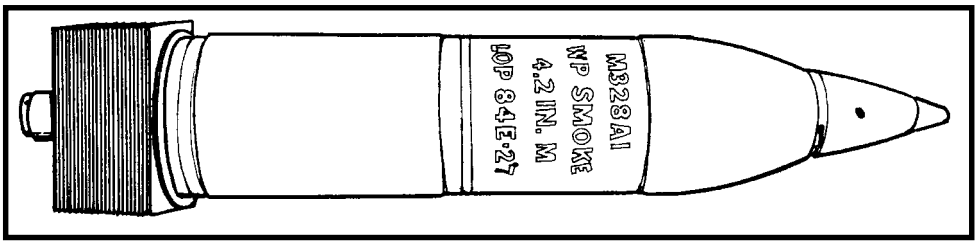

Figure 6-27. White phosphorus smoke 4.2-inch cartridge M328A1.

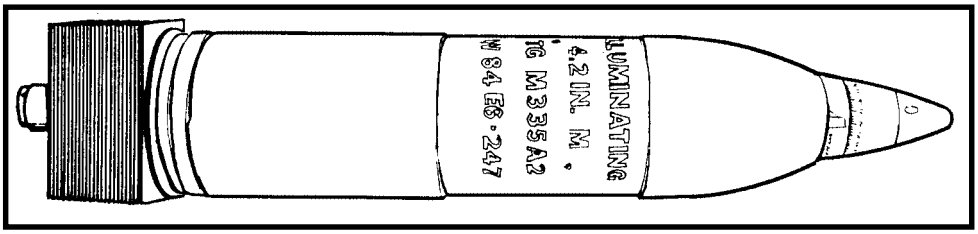

Figure 6-28. Illuminating 4.2-inch cartridge, M335A2, with mechanical time fuze, M565.

CARTRIDGE	TYPE	STANDARD	MINIMUM RANGE (METERS)	MAXIMUM RANGE (METERS)	EFFECTIVE BURSTING AREA (METERS)	AVERAGE BURN TIME (SECONDS)	RATE OF DESCENT (MPS)	COLOR CODING
M329A2	HE	A	770	6,840	40E20			OLIVE DRAB WITH YELLOW MARKINGS
M329A1	HE	(B)	920	5,650	40E20			OLIVE DRAB WITH YELLOW MARKINGS
M328A1	SMOKE	A	920	5,650				LIGHT GREEN WITH RED MARKINGS, YELLOW BAND
M325A2	ILLUM		400	5,490	1,500-METER DIAMETER	90	5	WHITE WITH BLACK MARKINGS
M335A1	ILLUM		640	5,290	800-METER DIAMETER	70	10	WHITE WITH BLACK MARKINGS
M2A1	GAS	A	870	4,540				TOXIC, NONPERSIS-TENT, GREY WITH GREEN MARKINGS, ONE GREEN BAND, ONE YELLOW BAND (IF BURSTER PRESENT)
M2	GAS	(B)	870	4,540				TOXIC, PERSISTENT, GREY WITH GREEN MARKINGS, TWO GREEN BANDS, ONE YELLOW BAND (IF BURSTER PRESENT)
XM430	TAC/CS			5,650		60		TOXIC V AND G AGENT, GREY WITH GREEN MARKINGS, THREE GREEN BANDS, ONE YELLOW BAND (IF BURSTER PRESENT) IRRITANT, NONPER-SISTENT, GREY WITH RED MARKINGS, ONE RED BAND, ONE YEL-LOW BAND (IF BURST-ER PRESENT) IRRITANT, PERSISTENT, GREY WITH RED MARKINGS, TWO RED BANDS, ONE YELLOW (IF BURSTER PRESENT)

Table 6-3. Ammunition for 4.2-inch mortar, M30.

6-31. TYPES OF FUZES

A fuze is a device used to explode a projectile at the time and under the circumstances required (Table 6-4).

a. **Classification.** Three types of nose fuzes are used with the 4.2-inch mortar ammunition: time, impact, and proximity.

(1) *Time fuze.* This fuze is designed to function while the round is still in flight. Certain time fuzes are also provided with a backup impact element (time and impact). There are two types of time fuzes:

(a) Mechanical time. This fuze uses a clockwork mechanism to delay functioning for a specific time.

- MTA—The entry to select for an air burst option when computing data with the M23 MBC (4.2-inch only).
- MTB—The entry to select for a below-surface burst option when computing data with the M23 MBC (4.2-inch only).

(b) Powder-train time. This fuze uses a compressed black powder train to delay functioning for a specific time.

CARTRIDGE	FUZE													
	PD					MT		MTSQ					PROX	
	M8	M48A3	M521	M51A5	M557	M562	M565	M501A1	M548	M577	M564	M520 Series	M513 Series	M514A1E1
CS M630									X					
GAS M2A1	X													
HE M329A1				X	X						X	X	P	
HE M329A2 (M329A1E1)					X						X	X		P
ILLUM M335A1						X		X						
ILLUM M335A2							X			X				
SMOKE WP M328		X												
SMOKE WP M328A1		X	X											

PD—POINT DETONATING
MT—MECHANICAL TIME
MTSQ—MECHANICAL TIME SUPERQUICK
PROX—PROXIMITY
P—REQUIRES REMOVAL OF SUPPLEMENTARY CHARGE, IF USED.

NOTE: When using the M732 fuze, see TM 43-0001-28.

Table 6-4. Fuze combination table for 4.2-inch mortar ammunition.

(2) *Impact fuze*. This fuze functions upon striking a resistant object. It is classified according to the time of function after impact as superquick or delay.

(3) *Proximity fuze.* This is a radio-activated point fuze that functions either after a preset arming time or, without setting or adjustment, upon approach to a target.

b. **Bore-safe Fuze.** A bore-safe fuze is one in which the explosive train is so interrupted that, while the round is still in the bore of the weapon, premature action of the bursting charge is prevented should any of the more sensitive elements (primer or detonator) function. The fuzes used with the ammunition described in this manual are considered *bore safe*.

6-32. PREPARATION OF AMMUNITION

To prepare a round for firing, remove the round from its container and the U-shaped packing stop from the tail assembly. Examine the round for burrs or deformities that might cause the round to stick in the tube or to malfunction. Ammunition with serious defects is not used. When handling a projectile, protect its base with the fiber container. Handle a round with its base up to protect the sensitive primer.

a. **Propelling Charges.** Propelling charges M6, M36Al, and M36A2 are used with 4.2-inch cartridges (Figure 6-29).

Note: When using propellants M36Al or M36A2, duds can occur when firing below charge 7.

(1) *Propelling charge, M6.* The M6 propelling charge consists of 25 1/2 increments assembled in the form of one half-increment sheet, four 5-increment bundles, and five single increments. The individual increments can be removed for firing adjustment (charge firing). The full propelling charge is assembled to the cartridge as issued. Maximum range is obtained with the full charge; lesser ranges, with fewer increments as indicated in the appropriate firing tables. The method of securing the propellant increments differs from round to round. In full charge for M2Al chemical (gas or smoke) cartridges, increments are held firmly between the pressure plate nut and propellant holder.

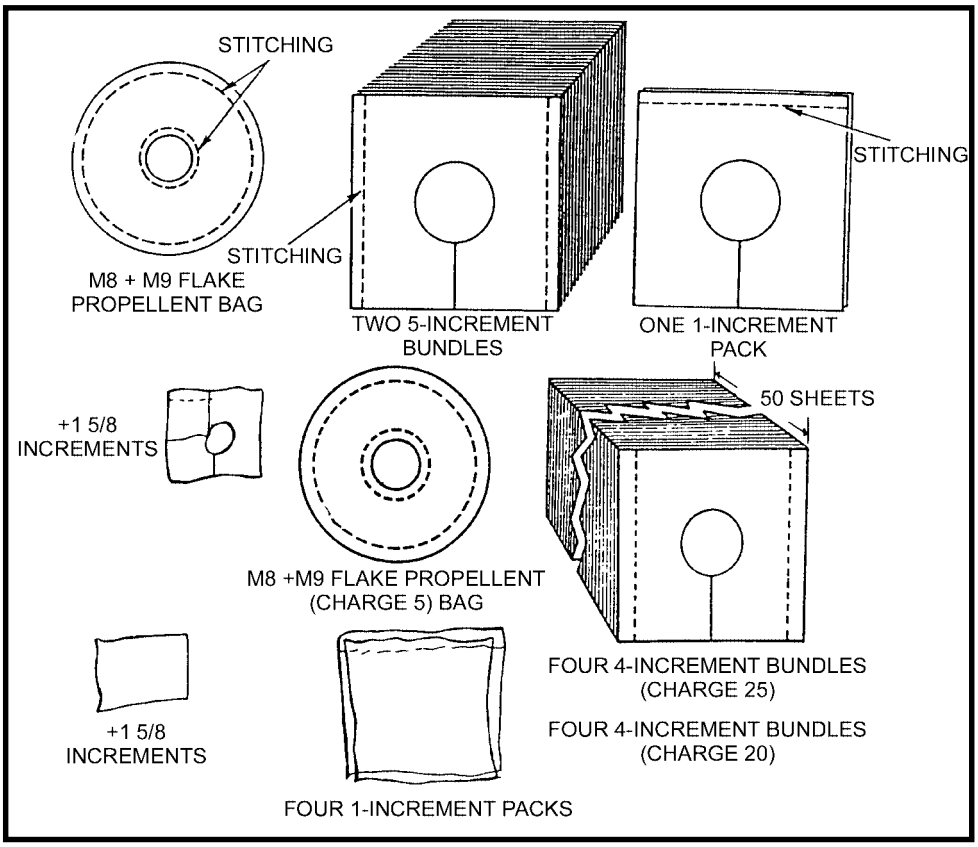

Figure 6-29. Arrangement of propelling charges.

(2) *Propelling charge, M36A1 and M36A2.* The M36Al and M36A2 propelling charges differ from the M36 propelling charge in that a doughnut-shaped cloth bag containing M9 flake propellant replaces the first five M8 sheet propellant increments. This doughnut-shaped bag is not removed at any time. The striker nut assembly and cartridge container extension have been modified to allow direct ignition of the propellant, eliminating the need for changing the position of the ignition cartridge when the extension is removed.

b. **Ignition Cartridges.** The M2 ignition cartridge is used with the M6 propelling charge, and the M2Al ignition cartridge is used with the M36Al propelling charge. Both ignition cartridges contain a primer and look like a commercial 12-gauge shotgun cartridge. The M2A2 ignition cartridge, which has greater resistance to moisture and longer shelf life than the M2A1 ignition cartridge, is used with the M36Al propelling charge only in the XM630 tactical CS M335A2 illuminating cartridge, and the M329A2 cartridge with the M36A2 propelling charge.

c. **Adjustment of the Propellant Charge.** The M329A2 cartridge is assembled with the M36A2 propellant charge. It composes a bag charge containing M8 propellant flakes and M8 propellant sheets.

(1) The bag charge is needed for proper burning of the propellant sheets and must not be removed in charge adjustment. The bag charge is located in the center of the propellant charge and must not be repositioned. The bag must be positioned over the flash holes in the

center of the tail assembly for proper ignition. The cartridge is shipped with a full charge assembled, which includes 39 increments with the bag charge counted as five charges.

(2) The propellant charge is arranged from the base of the projectile as follows:

- Three 5-increment bundles.
- Five 1-increment bundles.
- A bag charge of five increments.
- Two half-increment sheets.
- Three 1-increment bundles.
- Two 5-increment bundles.

Note: Only Firing Table 4.2-K-2 may be used to determine the proper charge of firing for the M329A2.

(3) Propellant charges should be removed equally from both sides of the bag charge until the required charge remains. Excess charge sheets should be placed in an empty wooden box with a lid to prevent accidental ignition during firing.

d. **Procedures.** To ensure proper ignition of increments when using the M6 propelling charge at less than full charge, the increments must cover the flash holes in the cartridge container and push up firmly against the striker nut. To use the M36Al propelling charge with fewer than 25 1/2 increments, the cartridge container extension is removedXthe ignition cartridge does not require repositioning.

e. **Precautions.** Inspection for proper assembly of propelling charge is essential to avoid excessive chamber pressures, erratic ranges, and short rounds. When firing at any charge other than maximum charge, the propelling charge must be varied depending on the mortar-target range. (Charges are set so that increments of 1/8, 2/8, or 3/8 will not stick between the 5-increment or 1-increment bundles. The procedure when a charge ends with 1/8, 2/8, or 3/8 is demonstrated in Figure 6-30.

16 2/8 CHARGE

Bag	= 5 increments
Two 5-increment bundles	= 10 increments
Two 5/8-increment sheets	= 1 2/8 increments
Total	= 16 2/8 increments

30 1/8 CHARGE

Bag	= 5 increments
Four 5-increment bundles	= 20 increments
Four 1-increment sheets	= 4 increments
One 4/8-increment sheet	= 4/8 increment
One 5/8-increment sheet	= 5/8 increment
Total	= 30 1/8 increments

11 2/8 CHARGE

Bag	= 5 increments
One 5-increment bundle	= 5 increments
One 6/8-increment sheet	= 6/8 increment
One 4/8-increment sheet	= 4/8 increment
Total	= 11 2/8 increments

24 3/8 CHARGE

Bag	= 5 increments
Three 5-increment bundles	= 15 increments
Three 1-increment sheets	= 3 increments
One 5/8-increment sheet	= 5/8 increment
One 6/8-increment sheet	= 6/8 increment
Total	24 3/8 increments

Figure 6-30. Examples of charges ending with 1/8, 2/8, or 3/8.

f. **Preparation of an Unfuzed and Fuzed Deep-Cavity Round.** The procedures for preparing an unfuzed and fuzed deep-cavity round are as follows:

(1) To prepare an unfuzed or fuzed round for firing with mechanical time superquick (MTSQ) fuze—

(a) Use the cover of the fiber container to cover the striker nut, cartridge extension, and propelling charge before fuzing the round. This cover protects against accidental ignition.

(b) Place the round on its side with the closing plug or fuze pointing to the right.

(c) Remove the closing plug. If a round is fuzed, insert an M18 or M7Al fuze wrench in the wrench slots of the fuze, ensuring the proper slot is used. Strike the wrench handle

sharply with the hand in a counterclockwise direction while looking downward on the fuze. Do not to strike any part of the fuze. Unscrew and remove the fuze.

(d) Inspect the cavity for damage and the presence of foreign material, and remove any loose material. If any HE filler is found adhering to the threaded portion of the fuze cavity, place the round aside for disposal by qualified ammunition personnel.

(e) Examine the nose threads and fuze to ensure they are in good condition—do not use components with damaged threads.

(f) Screw the fuze into the fuze cavity and tighten it securely with an M18 or M7Al fuze wrench. Make sure the fuze shoulder seats firmly against the nose of the shell so that no space exists between them. Do not remove the supplementary charge.

(g) If not fired, restore the fuze and shell to their original condition and packing.

(2) To prepare an unfuzed or a fuzed deep-cavity round for firing with the M513 proximity fuze—

(a) Perform the steps outlined above.

(b) Using the tab lifting loop, remove the supplementary charge. Screw in the proximity fuze by hand. If the fuze binds, inspect the fuze cavity and the threads of both fuze and shell. Reject whichever is defective.

(c) Tighten the fuze with the M18 fuze wrench. Use only such force as can be applied by hand. Do not hammer on the wrench or use an extension handle. Do not force the fuze to the cartridge under any circumstances. If the fuze cannot be tightened to form a good seat between the shell and fuze, reject the defective component.

g. **Preparation of the Fuze for Firing.** The procedures for preparing the fuze for firing are as follows.

(1) *M535 fuze.* To set the fuze for delay action, turn the slot 90 degrees to align it with the index mark for DELAY. The setting can be changed for firing with the screwdriver end of the M18 fuze wrench or a similar tool. If nighttime, feel for the slot position and make the correct setting.

(2) *M563 MTSO Fuze.* Remove the safety wire from the fuze. If only impact action is desired, set the fuze for 100 seconds. Do not fire fuzes when set on the shipping mark "S." If time action is required, set the fuze to the desired time to the nearest 1/2 second using the M14, M26, M27, or M63 fuze setter.

Note: If the fuze is not fired after setting, reset the fuze to SAFE and replace the safety wire in its proper position before defuzing the round and returning the components to their packing containers. Turn the fuze in a clockwise direction only.

(3) *M513 Proximity fuze.* Make time settings the same as for a mechanical time fuze. Looking down on the nose of the fuze, rotate the M28 fuze setter in a clockwise direction. If point detonating action is desired, place a time setting of 90 seconds on the fuze.

(4) *M572 and M565 mechanical time fuzes.* These fuzes are used with the base-ejection M335Al and M335A2 illuminating projectiles. Because of size and difference in threads, they cannot be interchanged with the MTSQ M501Al fuze. These fuzes differ from the MTSQ M50lAl fuze in that they have a vernier scale to allow for accurate settings to the nearest .1 second. Set time by turning the fuze in a clockwise direction only. For further information on these fuzes, see TM 43-0001-28.

(5) *M557 point-detonating fuze.* This fuze is similar to the PD 5lA5 fuze. The difference is that the M557 fuze contains a booster M125A1, which is a manufacturing component of the fuze and incorporates a delayed arming feature. This fuze is a combination superquick/delay fuze.

Note: When making time settings using the time fuzes, follow the NO-BACKUP rule, since backing up can damage the internal workings of some fuzes. To do so, the fuze time scale is made to turn clockwise. If the time required is exceeded, continue to turn the fuze until the proper time is in line again. If the time is exceeded and the fuze is turned counterclockwise, the internal parts of the fuze may be damaged, causing some fuzes to malfunction.

6-33. CARE AND HANDLING

Because explosives are adversely affected by moisture and high temperature, the following precautions must be observed

a. Do not break the moisture-resistant seal on the fiber container until the ammunition is to be used.

b. Protect the ammunition (particularly the fuze and the propellant) from high temperatures, including the direct rays of the sun. More uniform firing is obtained when the rounds are at the same temperature. When the filling of the white phosphorous (WP) shell melts (111.4 degrees F) and then hardens in any position other than on its base, a large percentage of the rounds will tumble in flight and result in duds. To prevent this, store WP-filled shells in an upright position (fuze end up).

c. Do not remove safety devices from the fuze until just before firing.

d. Keep the round and the propelling charges dry. Moisture causes incomplete combustion of the propelling charges, reduces the range, and can cause short rounds.

e. When ammunition is left in the open, place it on at least six inches of dunnage and cover it with a double thickness of tarpaulin. Dig trenches around the pile to prevent water from flowing under it.

Note: For further precautions in storage, see TM 9-1015-215-10, TM 9-1300-206, and FM 9-207.

f. Before loading the round, make sure it is free of foreign matter such as sand, mud, and grease.

g. Protect the propelling charges of the rounds prepared for firing by slipping one end of the fiber container over the base of the round.

h. Return rounds prepared for firing to their original condition by reinserting the safety pins (when applicable), replacing the packing, and repacking the rounds into their original containers. Inspects fuzes before repacking. To keep opened stocks at a minimum, use repacked rounds first in subsequent firing exercises.

WARNING

Do not handle duds; the fuzes could be armed. Duds are extremely dangerous. Do not move or turn them. To dispose of duds, immediately call the nearest EOD unit.

i. To maintain accuracy in firing, it is important that ammunition of the same lot number be used on a given mission.

j. To know how much ammunition of a given lot number each squad has, ammunition should be stored by lot number. Storing ammunition by lot number also facilitates keeping track of suspended lots of ammunition as well as giving a means of determining which ammunition has been on position the longest. Ammunition that has been on position the longest should be fired first.

k. When repacking, do not mix lot numbers of ammunition.